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Relationships Between Hydric Soil Indicators and Wetland Hydrology for Sandy Soils in Florida

by Debra S. Segal, Steven W. Sprecher, Frank C. Watts



February 1995 – Final Report

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	Task		Task
CP	Critical Processes	RE	Restoration & Establishment
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Wetlands Research Program

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Final report

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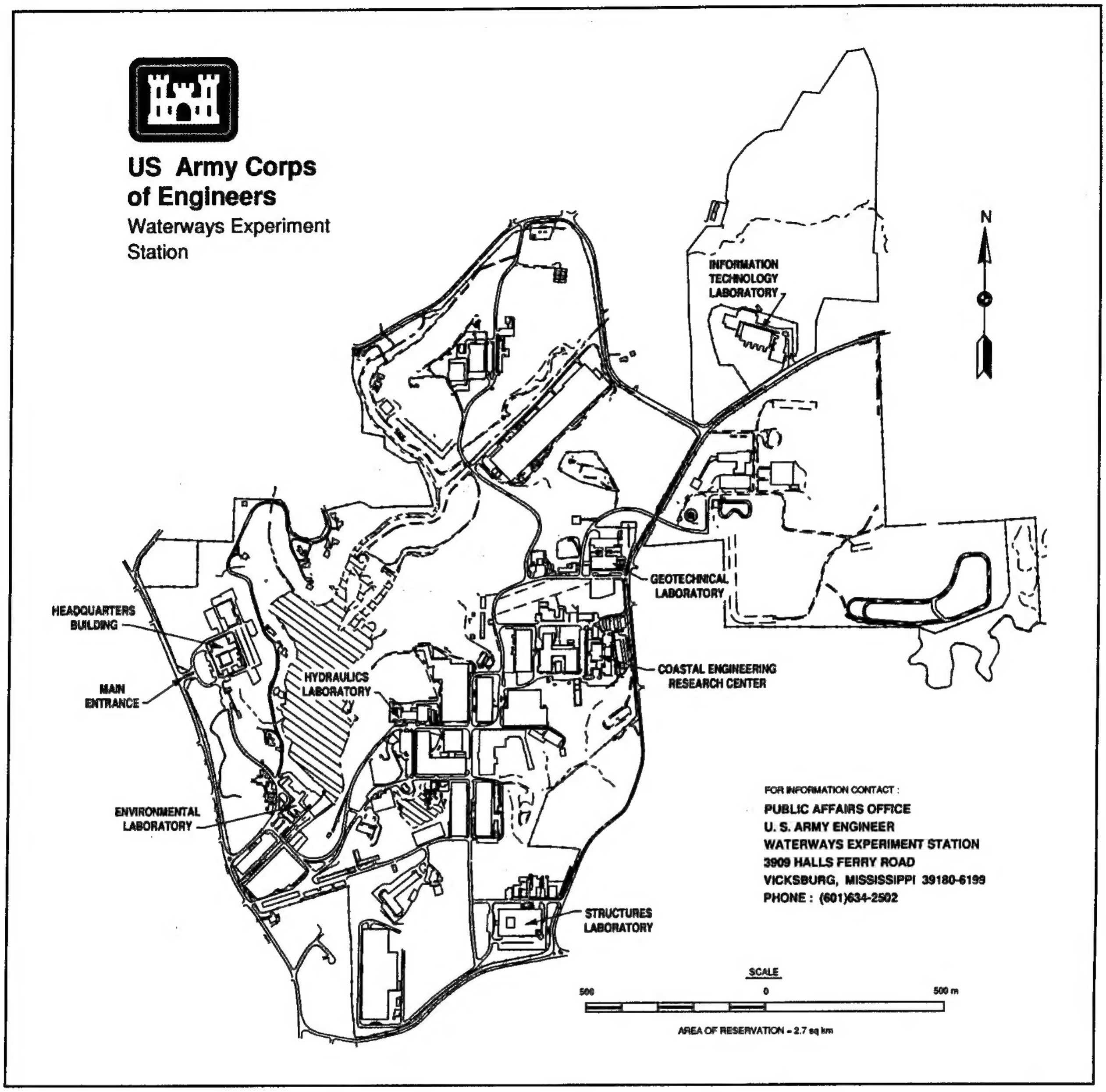

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Wetland Soils

Relationships Between Hydric Soil Indicators and Wetland Hydrology for Sandy Soils in Florida (TR WRP-DE-7)

ISSUE:

Several alternative lists of hydric soil indicators have been proposed for use in delineating jurisdictional wetlands in the sandy landscapes of the southeast coastal plain. Because the issue is so recent, very little quantitative research has been conducted to test the validity of these alternative lists.

RESEARCH:

Presence of various hydric soil indicators from four different hydric soil lists was compared with 3 to 5 years of shallow water well data along 14 wetland transects in peninsular Florida. Lists of indicators recently proposed by the USDA Soil Conservation Service were an improvement to the list of hydric soil indicators currently mandated in the Corps of Engineers 1987 and 1989 Wetlands Delineation Manuals.

SUMMARY:

Wetland hydrology and morphological indicators of sandy hydric soils were compared at 58 sites along 14 transects in Florida. The best correspondence between hydrology and soil morphology was found for accumulation of muck on the soil surface and sulfur smell. Poorest correspondence was found for subsoil mineral horizon features such as organic accretions, thick dark A horizon, wet Spodosol, and vertical streaking.

AVAILABILITY OF REPORT:

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About the Authors:

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Preface

The work described in this report was authorized by Headquarters, U.S. Army Corps of Engineers (HQUSACE), as part of the Delineation and Evaluation Task Area of the Wetlands Research Program (WRP) and is assigned to the U.S. Army Engineer Waterways Experiment Station (WES) under the purview of the Environmental Laboratory (EL). The work was performed under Work Unit 32755, "Wetland Delineation," for which Dr. James S. Wakeley was Technical Manager. Mr. Sam Collinson (CECW-OR) was the WRP Technical Monitor for this work.

Mr. Dave Mathis (CERD-C) was the WRP Coordinator at the Directorate of Research and Development, HQUSACE; Dr. William L. Klesch (CECW-PO) served as the WRP Technical Monitors' Representative; Dr. Russell F. Theriot, U.S. Army Engineer Waterways Experiment Station (WES), was the Wetlands Program Manager. Mr. Ellis J. Clairain, WES, was the Task Area Manager.

The work was performed at KBN Engineering and Applied Sciences, Inc., Gainesville, FL. This report was prepared by Ms. Debra S. Segal, Dr. Steven W. Sprecher, and Mr. Frank C. Watts, under contract No. DACW39-92-R-0016 under the general supervision of Dr. Wakeley, Research Wildlife Biologist, WES, and the direct supervision of Dr. Sprecher, Soil Scientist, WES.

The University of Florida Center for Wetlands provided field assistance and hydrologic records for all sites studied; Messrs. John Bailey and Tom Mirti provided technical assistance. The Florida Soil Conservation Service (SCS) provided assistance during field data collection and overall technical guidance. SCS soil scientists Lou Carter, Richard Ford, Warren Henderson, Wade Hurt, Robert Jones, and Patrick Megonigal. Dr. James Wakeley also provided valuable comments to this report.

The Nature Conservancy, Arlington, VA, permitted the study team access to three field sites at Tiger Creek Nature Preserve and provided hydrologic records of these sites.

At the time of publication of this report and during the conduct of the study, EL supervisory and management personnel were Mr. E. Carl Brown,

Chief, Wetlands Branch, Dr. Conrad Kirby, Chief, Ecological Research Division, and Dr. John W. Keeley, Director.

Director of WES was Dr. Robert W. Whalin. Commander was COL Bruce K. Howard, EN.

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Summary

Soil morphological features, known as hydric soil indicators, are frequently used to infer hydrologic conditions in wetland communities. Low chroma soil color, with or without high chroma mottles, is perhaps the most widely used hydric soil indicator. However, this indicator is not very useful in sandy soils where there is insufficient iron to produce the characteristic color patterns indicative of prolonged saturation (Hyde and Ford 1989, Vepraskas 1992). Federal regulatory agencies have developed several hydric soil indicator lists for use in sandy soils. However, the relationship between wetland hydrology and sandy hydric soil indicators has not been well studied. The purpose of this study was to assess the relationship between wetland hydrology and sandy hydric soil indicators using four different lists of hydric soil indicators.

This study utilized multiple year hydrology data to test the reliability of hydric soil indicators to predict hydrology. Monthly water levels were measured in wells situated along upland-to-wetland transects at 14 sites throughout Florida by the University of Florida's Center for Wetlands. Wetland hydrology was defined at each site using the hydric soil criteria adopted by the National Technical Committee for Hydric Soils (USDA Soil Conservation Service 1991). Soil pits were dug adjacent to each monitoring well. The soil profile was described for each pedon, and hydric soil indicators were evaluated using the following four hydric soil indicator lists: Hydric Soil Indicators for Florida (Florida Soil Survey Staff 1992); USDA Soil Conservation Service Regional Hydrologic Indicators (USDA Soil Conservation Service South National Technical Center 1992); the Federal Manual for Identifying and Delineating Jurisdictional Wetlands (Federal Interagency Committee for Wetland Delineation 1989) (1989 Manual); and the U.S. Army Corps of Engineers Wetlands Delineation Manual (Environmental Laboratory 1987) (1987 Manual).

On the Florida and regional hydric soil indicator lists, presence of a surface organic horizon was a strong and reliable predictor of wetland hydrology. In addition, this indicator was easy to detect regardless of current hydrologic and/or soil chemical conditions. Presence of sulfidic material (rotten egg odor) was also a strong hydric soil indicator, although this indicator was seasonally variable and was frequently absent during the dry season. A mucky textured surface horizon, organic matter accretions in the upper 15 cm, and a thick dark A horizon were present over a wider range of hydrologic

conditions and, consequently, were more indicative of marginally wet or transitional wetlands.

The 1987 and 1989 manuals listed six hydric soil indicators that were strong predictors of wetland hydrology. These included Histosol, histic epipedon, high organic matter, soils present on the county or NTCHS hydric soils list, aquic or peraquic moisture regime, and presence of sulfidic material. Histosol and histic epipedon were the only sound morphological features that could easily and consistently be identified in our study. Although high surface organic matter content was a strong indicator, it was very subjective in application. Soils present on the county or NTCHS hydric soils list, and soils with an aquic or peraquic moisture regime were frequently present in wetland conditions. However, these two indicators are not soil morphological characteristics, and they require an in-depth knowledge of soil survey and classification to be properly utilized in the field. Vertical streaking in subsurface horizons and wet Spodosols occurred with roughly equal frequency in wetland and nonwetland conditions and, hence, were the least reliable hydric soil indicators using the 1987 and 1989 manuals. Other indicators listed on each of the four hydric soil indicator lists could not be evaluated due to a low sample size or because they did not occur at the sites sampled.

Soil water table records used by this study may indicate lower water table depths than actually occurred. Therefore, conclusions about reliability of individual hydric soil indicators may be conservative. Indicators that accurately predicted wetland hydrology are presumably very dependable indicators (Histosol, histic epipedon, muck surface, and sulfidic odor). Those that were less reliable should be used with more caution (mucky texture, thick dark A horizon, organic accretions, presence on a hydric soils list).

1 Introduction

Use of the hydric soil parameter in delineation of jurisdictional wetlands assumes a strong correspondence between soil morphology and wetland hydrology. Such a correspondence has been established in soils with high contents of readily reducible iron and manganese. Surface horizons of sandy soils in the southeastern coastal plain, however, often have too little of these elements to change color under the influence of very shallow water tables. Therefore, Federal regulatory agencies have tried to identify features that reflect oxidation or reduction of other elements in the soil, such as carbon and sulfur, and use these features to infer wetland hydrology in these sandy soils.

The relationship between hydrologic conditions, soil chemistry, and diagnostic soil characteristics in nonsandy soils has been studied by several researchers (Daniels, Gamble, and Nelson 1971, Franzmeier et al. 1983, Pickering and Veneman 1984, Faulkner and Patrick 1992, and Megonigal, Patrick, and Faulkner 1993). A primary focus in these investigations was the relationship between low chroma color and water table depth. In general, gleyed soils, low chroma soils, and soil mottling were indicative of wetland hydrologic conditions. Megonigal, Patrick, and Faulkner (1993) concluded that hydric soil indicators (mottling, gleying, and histic epipedon) were accurate surrogates for direct measurements of hydrology; soils that contained a diagnostic hydric soil indicator within 30 cm of the surface were saturated at or above 15 cm for at least 30 days.

Whereas color is an excellent diagnostic indicator in many hydric soils, it is frequently not diagnostic in sandy hydric soils due to insufficient quantities of iron and/or manganese necessary to produce color patterns indicative of frequent anaerobic conditions. Because of this limitation, the U.S. Army Corps of Engineers (USACE) Wetlands Delineation Manual (Environmental Laboratory 1987) and the Federal Manual for Identifying and Delineating Jurisdictional Wetlands (Federal Interagency Committee for Wetland Delineation 1989) specified three additional indicators commonly associated with sandy hydric soils: high organic matter content in the surface horizon, dark vertical streaking by organic matter in subsurface horizons, and organic pans (wet Spodosols). To improve the accuracy of hydric soil determinations, Hurt and Puckett (1992) proposed new diagnostic field indicators specifically for sandy soils in Florida.

The purpose of this study was to determine which hydric soil indicators for sandy soils were most indicative of the hydrologic conditions defined by hydric soil criteria (USDA Soil Conservation Service 1991), and, thus, determine which soil characteristics were the best indicators of wetland hydrology. The study used existing shallow water table data collected as part of a wetland ecology study conducted by the Center for Wetland and Water Resources at the University of Florida (Brown and Tighe 1991). Consequently, hydrologic sampling was designed for the goals and objectives established for Brown and Tighe's (1991) study. Although the well configuration and measuring frequency were not tailored for this project, the hydrologic data set provided a valuable opportunity to compare surface water hydrology and hydric soil indicators along upland-to-wetland transects.

Hydric soil indicators described in four different sources were examined:

- Hydric Soil Indicators for Florida (Florida Soil Survey Staff 1992),
- Regional Hydrologic Indicators (USDA Soil Conservation Service South National Technical Center 1992),
- The Federal Manual for Identifying and Delineating Jurisdictional Wetlands (Federal Interagency Committee for Wetland Delineation 1989),
- USACE Wetlands Delineation Manual (Environmental Laboratory 1987).

Throughout this report, these hydric soil indicator lists will be referred to as the Florida list, regional list, 1989 Manual, and 1987 Manual, respectively.

2 Methods

Hydrologic Monitoring

This study was conducted on research sites previously established by personnel of the University of Florida Center for Wetlands & Water Resources (Brown and Tighe 1991). Of the 40 original study locations monitored by University of Florida researchers, 14 were selected for use in this study (Figure 1). No additional hydrologic monitoring was conducted for this study. Rather, the existing hydrologic records were compared with soil indicators at each well site.

Criteria used to screen the original 40 locations and select the 14 study locations were: (a) lack of significant site disturbance, (b) wells that were undisturbed and had not shifted, (c) transects that extended from a well-defined upland to a well-defined wetland, (d) long period of hydrologic record, and (e) minimally interrupted hydrologic data set. The 14 study locations selected included 4 herbaceous marshes, 2 cypress domes, 2 bayheads, 4 stream floodplains, and 2 lake fringes. A summary of the hydrologic record for each location is provided in Table 1.

These study locations were selected, in part, for lack of hydrologic disturbance. However, most of Florida has been subjected to some form of hydrologic manipulation, including surface water channelization and groundwater removal. It is conceivable that due to offsite hydrologic manipulation, the hydrology at these study sites may have been indirectly affected by such activities. Locations selected showed the least amount of disturbance and contained the longest uninterrupted hydrologic record.

University of Florida researchers installed shallow wells along wetland-to-upland transects. Typically, four groundwater wells were installed, two in the upland, one in the deepest part of the wetland, and one in the interface or ecotone between the upland and wetland (Figure 2).

Wells were constructed of 4.5-cm schedule 40 polyvinyl chloride (PVC) pipe, with a 0.33-m section of slotted well screen at the bottom. Well bottoms were capped to prevent substrate intrusion and well tops were capped to prevent direct input of rainfall or contaminants. Wells were installed by

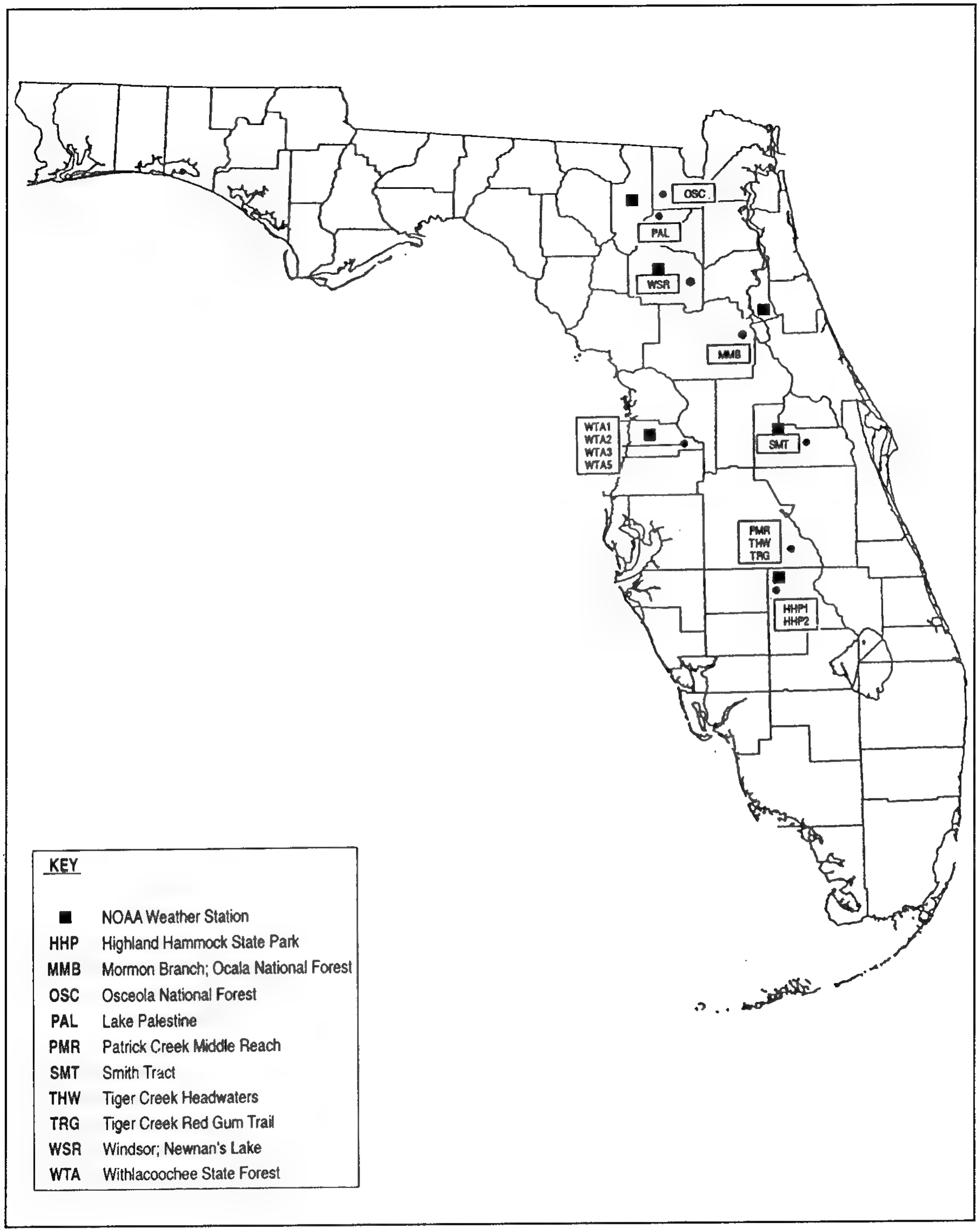

Figure 1. Locations of study transects and weather stations

Table 1
Summary of Hydrologic Record for Each Transect Location

Location[1]	Wetland/Upland Community Type	Length of Hydrologic Record, Months	Hydrologic Monitoring	Existing Gaps in Hydrologic Record, Months
HHP1	Bayhead/flatwoods	46	Mar. 1986 through Dec. 1989	0
HHP2	Marsh/flatwoods	45	Mar. 1986 through Dec. 1989	0
MMB	Stream floodplain/scrub	55	Feb. 1985 through Dec. 1989	4
OSC	Cypress dome/flatwoods	55	Feb. 1985 through Dec. 1989	3
PAL	Lake fringe/oak upland	27	Apr. 1987 through Dec. 1989	6
PMR	Stream floodplain/oak upland	53	Sep. 1985 through Feb. 1992	23
SMT	Bayhead/flatwoods	44	Mar. 1985 through Jun. 1989	8
THW	Stream floodplain/scrub	46	Jun. 1985 through Jan. 1991	22
TRG	Stream floodplain/scrub	37	Feb. 1986 through Jan. 1991	18
WSR	Lake fringe/flatwoods	24	Feb. 1987 through Dec. 1989	9
WTA1	Marsh/oak upland	43	Apr. 1985 through Jan. 1989	3
WTA2	Marsh/oak upland	43	Apr. 1985 through Sep. 1989	3
WTA3	Marsh/oak upland	45	Jun. 1985 through Sep. 1989	2
WTA5	Cypress dome/flatwoods	53	Jun. 1985 through Dec. 1989	1

[1] Study locations are depicted in Figure 2.

manually digging a hole with an 8-cm soil bucket auger as deep below the groundwater table as possible before the hole began to fill up with sloughing saturated sand. The well was inserted into the augured hole and the excavated soil material was loosely compacted in the surrounding space. Relative elevation of each well along the transect and well height above the ground were measured using a stadia rod and transit.

Water levels were measured monthly for 2 to 5 years by lowering a weighted tape measure until the water was encountered. The tape was then raised and lowered several times, tapping the water surface, until a consistent level was determined. Water table measurements were expressed as depth above or below ground surface. Hydrographs from each site are provided in Appendix A.

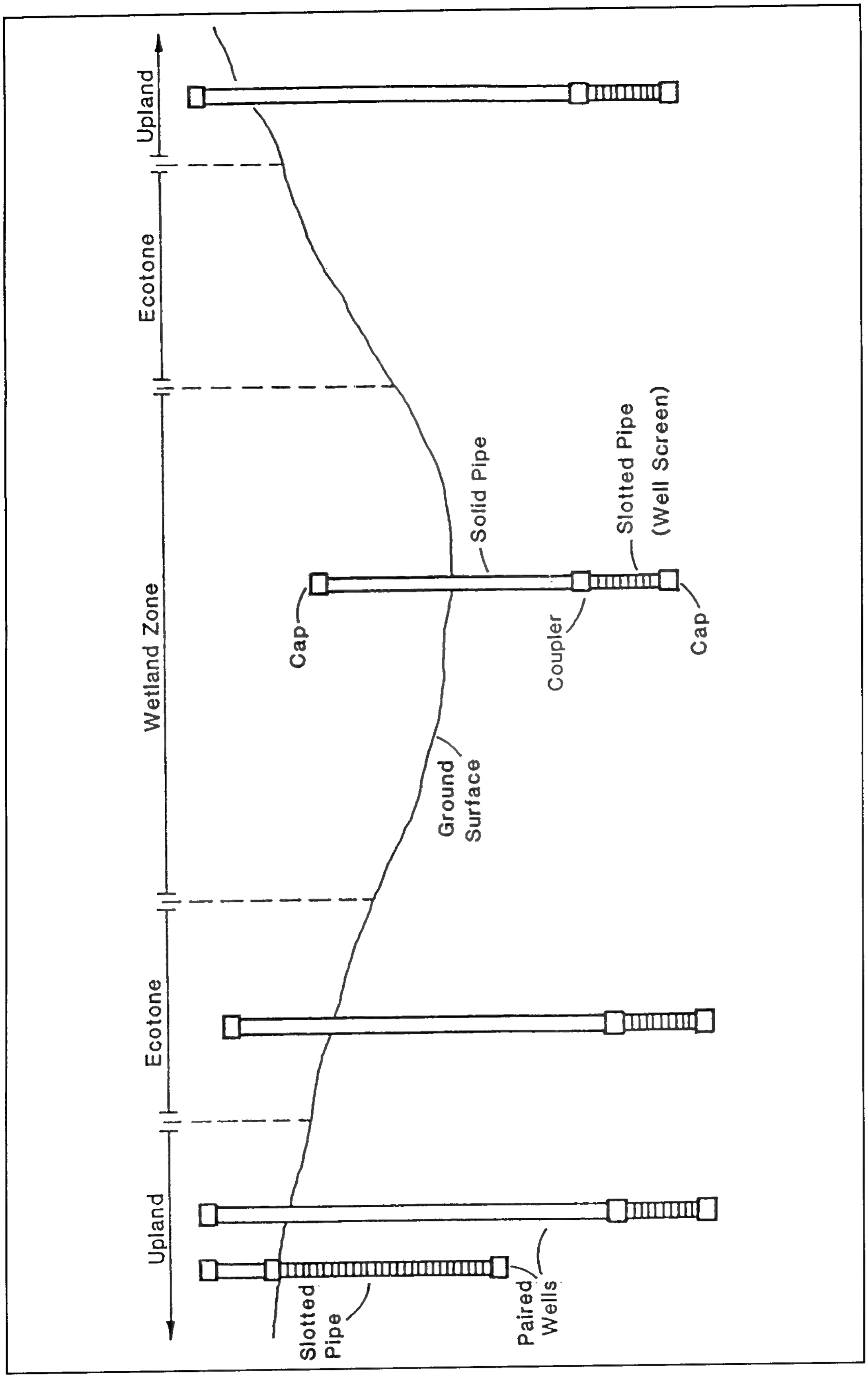

Figure 2. Ground surface profile, showing typical location and construction of groundwater wells

Evaluation of Hydric Soil Criteria

Hydric soil criteria developed by the National Technical Committee for Hydric Soils (NTCHS) (USDA Soil Conservation Service 1991) and adopted for use with the Florida indicator list, the 1989 Manual, and the 1987 Manual are as follows:

1. All Histolsols except Folists, or

2. Soils in Aquic suborders, Aquic subgroups, Albolls suborders, Salorthids great group, Pell great groups of Vertisols, Pachic subgroups, or Cumulic subgroups that are:

   a. Somewhat poorly drained and have a frequently occurring water table at less than 15 cm from the surface for a significant period (usuallly more than 2 weeks) during the growing season, or

   b. Poorly drained or very poorly drained and have either:

      (1) A frequently occurring water table at less than 15 cm from the surface for a significant period (usually more than 2 weeks) during the growing season if textures are coarse sand, sand or fine sand in all layers within 50 cm, or for other soils;

      (2) A frequently occurring water table at less than 30 cm from the surface for a significant period (usually more than 2 weeks) during the growing season if permeability is equal to or greater than 15 cm/hour in all layers within 50 cm; or

      (3) A frequently occurring water table at less than 45 cm from the surface for a significant period (usually more than 2 weeks) during the growing season if permeability is less than 15 cm/hour in any layer within 50 cm; or

3. Soils that are frequently ponded for long duration or very long duration during the growing season, or

4. Soils that are frequently flooded for long duration or very long duration during the growing season.

Average growing season dates for each county were determined from county soil survey reports as the average period of frost-free (32°F) (0°C) days for 5 years out of 10.

To analyze our database according to the hydrologic conditions specified in the hydric soil criteria, we established specific guidelines to determine whether or not hydric soil criteria were met at each well site. We considered a site to meet the hydric soil criteria and, thus, possess wetland hydrology if the water

table occurred above a critical depth for two consecutive monthly monitoring periods during the growing season during most years of measurement (either 2 of 3 years, 2 of 4 years, or 3 of 5 years, depending on the existing hydrologic record). The critical depth established for this study was -30 cm for soils with an organic horizon at least 7.5 cm thick, or -15 cm for soils with an organic horizon less than 7.5 cm thick or lacking an organic horizon. These critical depths closely approximate the depths based on soil drainage class and permeability in Items 2a, 2b1, and 2b2 of the hydric soil criteria. Because this study addresses sandy hydric soils, we were only interested in evaluating those portions of the hydric soil criteria. We assumed that if the water table was above the critical depth for two consecutive monthly monitoring periods, then the water table was likely to be above the critical depth for a significant period of at least two consecutive weeks as stipulated in the hydric soil criteria.

A site was considered marginally wet in its hydrologic characteristics if typically only one water table measurement prevented the site from satisfying the hydrologic standards described. Characteristics typical of a marginally wet site included:

a. Only one water table measurement which was slightly below the critical depth caused the site to not satisfy the wetland hydrology criteria; or

b. Several water table readings were at or above the critical depth, although these readings were not consecutive for most years of the monitoring record; or

c. The two-month period in which the water table was above the critical depth overlapped the boundary between the growing season and the nongrowing season.

If none of these criteria were met, the site was designated as a dry site.

Precipitation data during the time of hydrologic monitoring were obtained from National Oceanic and Atmospheric Administration (NOAA) weather stations nearest the study sites (Figure 1). To determine annual deviation of precipitation from normal, the actual rainfall amounts measured at each weather station were compared with the normal precipitation from each station as compiled from 1961 through 1990 (Owensby and Ezell 1992).

Water Table Exceedance Frequency

An exceedance frequency represents how often, as a percent, the water table exceeds a specified depth. Exceedance frequencies were calculated for three water table depths: (a) at or above ground surface, (b) at or above -15 cm, and (c) at or above -30 cm. Exceedance frequencies were calculated

for the entire hydrologic record for each site, rather than only for the growing season. No distinction was made between consecutive and nonconsecutive water table readings above a critical depth, as was used to determine hydric soils.

Evaluation of Hydric Soil Field Indicators

A detailed soil profile description was made at each well site. Soil pits were dug within 10 m of the well and at the same elevation. A total of 63 soil profiles were described at 15 sites following standard USDA Soil Conservation Service (SCS) procedures (USDA Soil Survey Staff 1981). Each soil horizon was described with respect to texture, thickness, Munsell color (Kollmorgen Corporation 1975), structure, consistence, boundary, and presence of roots. After each profile was described, the pedon was evaluated for presence or absence of hydric soil indicators according to four hydric soil indicator lists (Table 2). We did not evaluate prevalence index, which is listed on the regional hydric soil list, because it is a vegetation rather than a soil indicator. Of the 63 soil profiles described, 58 at 14 sites were sandy in the upper 30 cm of the profile and were evaluated using the soil indicator lists for sandy soils. Due to the small sample size, the five nonsandy soils were not included in the analysis. Each soil profile was classified to the series and map unit level by three SCS soil scientists working in the state of Florida. Soil profile descriptions from each site are provided in Appendix B.

Statistical Analysis

The Mann-Whitney test, a nonparametric analog of the t-test, was used to determine if exceedance frequencies were significantly associated with presence or absence of each hydric soil indicator. The same procedure was used to determine if indicators were significantly associated with the standard deviation of water table depths. The analyses were also conducted using pairs of hydric soil characteristics (for example, presence of both organic accretions and a wet Spodosol).

Table 2
Hydric Soil Indicators from Four Sources

Hydric Soil Indicator		Florida List[a]	Regional List[b]	1989 Manual[c]	1987 Manual[d]
1.	Muck, peat, or mucky peat horizon of any thickness if no root or leaf mat is present, or at least 1 cm thick if a root or leaf mat is present	X	X	—	—
2.	Histic epipedon (organic horizon 20 to 40 cm thick)	—	—	X	X
3.	Histosol (organic horizon greater than 40 cm thick)	—	—	X	X
4.	Mucky texture (e.g. mucky fine sand) at least 5 cm thick in the upper 15 cm	X (upper 15 cm)	X (location not specified)	—	—
5.	An upper A horizon at least 10 cm thick, with a color value of 3 or less and a chroma of 1 or less, and more than 70 percent of the soil particles covered or coated with organic matter	X	X	—	—
6.	High organic matter content in the surface horizon[e]	—	—	X	X
7.	Presence of organic accretions approximately 1 to 3 cm in size in the top 15 cm of soil	X	X	—	—
8.	Presence of stratified (horizontal) layers in the upper 5 cm of soil containing a high content of organic matter	X	X	—	—
9.	Dark vertical streaking of organic matter in subsurface horizons	—	—	X	X
10.	Wet Spodosol[f]	—	—	X	X
11.	Oxidized rhizospheres along root channels in the upper 15 cm	X	—	—	—
12.	Presence of sulfidic material (rotten egg odor)	X (upper 30 cm)	—	X (upper 45 cm)	X (upper 40 cm)

(Continued)

[a] Florida Soil Survey Staff (1992).
[b] USDA Soil Conservation Service South National Technical Center (1992).
[c] Federal Interagency Committee for Wetland Delineation (1989).
[d] Environmental Laboratory (1987).
[e] In the absence of guidance on how to determine "high organic matter," we decided that high organic matter was present if the soil met condition number 1, 2, 3, 4, 5, or 7 above.
[f] Defined as a spodic horizon occurring between 30 and 75 cm in the soil profile, with a thick dark surface horizon, and a thick dull gray E horizon (1987 and 1989 Manuals).

Table 2 (Concluded)

Hydric Soil Indicator		Florida List	Regional List	1989 Manual	1987 Manual
13.	Reducing soil conditions using a ferrous iron colorimetric field test	-	-	X	X
14.	Aquic or peraquic moisture regime[g]	-	-	X	X
15.	Soil listed on hydric soil list[h]	-	-	-	X
16A.	For nonsandy soils, gleyed, low chroma, or low chroma/mottled soils	-	-	X (below the A horizon)	X (upper 25 cm)
16B.	Gleyed colors within 30 cm for nonsandy soils and within 15 cm for sandy soils	X	-	-	-
16C.	For nonsandy soils, low chroma (2 or less in 60 percent or more of the matrix) and presence of at least 5 percent by volume of distinct or prominent mottles which are 10YR or redder within the upper 25 cm of soil	X	-	-	-
17A.	Iron or manganese concretions	-	-	X	X (at least 2 mm in dia. within the upper 18 cm)
17B.	For nonsandy soils, at least 2 percent by volume of iron or manganese concretions in the upper 25 cm, and a moist chroma of 2 or less	X	X	-	-
18.	Polychromatic matrix within the upper 15 cm[i]	X	X	-	-
19.	For nonsandy soils, a surface layer texture of marl	X	X	-	-
20.	Vegetation prevalence index of 2 or less	-	X	-	-

[g] Determined directly by observing water on the soil surface or within the majority of the root zone or indirectly by observing indicators of recent flooding (i.e., water marks, drift lines, sediment deposits, scoured areas, or drainage patterns within wetland).
[h] County hydric soil lists were consulted first. If the soil series was not present on the county list then the NTCHS hydric soils list was consulted (USDA Soil Conservation Service 1991).
[i] Matrix dominated by 2 or more colors arranged in a splotchy pattern. Described in the Florida list as a color value of 5 or more, and chroma of 1, and/or 2, and 3, and/or 4.

3 Results

Hydrology

Mean precipitation during the study period at NOAA weather stations in the vicinity of study sites ranged from 88.6 to 106.5 percent of normal precipitation (Table 3; Owensby and Ezell 1992). The Crescent City and Avon Park NOAA weather stations received below normal rainfall for all study years in which rainfall data were available, whereas the other weather stations received more variable rainfall throughout the study period.

Of the 58 sandy soil sites investigated, 29 (50 percent) met the hydric soil criteria by exhibiting a water table at or above the critical depth for at least two consecutive monthly monitoring periods for most years of measurement (Table 4). These sites were designated as "wet" sites. Three sites (5 percent) contained "marginal" wetland hydrology during the period of record. The remaining 26 sites (45 percent) failed to meet the hydric soil criteria and were considered "dry" sites. Water table depths at these dry sites were measured

Table 3
Percent of Normal Rainfall Received at NOAA Weather Stations Near Study Sites

NOAA Weather Station[a]	Percent of Normal Rainfall						
	1985	1986	1987	1988	1989	1990	Mean
Lake City	96	100[c]	107	109	72	—	96.8
Gainesville	—	—	81[b]	118	78	—	92.3
Crescent City	90[b]	91	84	94	84	—	88.6
Orlando	91[c]	104	127	109	95	—	105.2
Brooksville	—	109[b]	110	124[b]	83	—	106.5
Avon Park	81[c]	—	—	99	94[b]	92	91.5

[a] Figure 1 shows locations of weather stations.
[b] One month of rainfall data missing.
[c] Two months of rainfall data missing.

Table 4
Summary of Hydrology Data and Hydric Soil Indicators for Each Site

Site Number	Mean Water Table Depth (cm)	Percent Observations		Hydric Soil Indicator
		Water Table Above -15 cm	Water Table Above -30 cm	
Wetland Hydrology Met[a]				
HHP 1/2	-24.4	48	80	Muck, high organic matter, aquic moisture regime, Histosol, hydric soils list
HHP 1/3	-14.0	74	80	Muck, sulfur smell, high organic matter, aquic moisture regime, hydric soils list, Histosol
HHP 1/4	-33.0	22	63	Muck, sulfur smell, high organic matter, aquic moisture regime, Histosol, hydric soils list
HHP 2/2	-11.0	69	83	Muck, mucky texture, accretions, aquic moisture regime, hydric soils list, high organic matter
HHP 2/3	62.2	96	98	Muck, sulfur smell, high organic matter, Histosol, aquic moisture regime, hydric soils list
HHP 2/4	12.3	89	89	Muck, sulfur smell, high organic matter, Histosol, aquic moisture regime, hydric soils list
MMB 2	-17.3	26	100	Muck, high organic matter, Histosol, aquic moisture regime, hydric soils list
MMB 3	-16.6	33	98	Muck, high organic matter, Histosol, aquic moisture regime, hydric soils list
OSC 1	-15.1	57	82	Muck, high organic matter, wet Spodosol, hydric soils list
OSC 2	9.4	93	100	Muck, high organic matter, histic epipedon, hydric soils list
OSC 3	2.8	93	96	Muck, high organic matter, wet Spodosol, aquic moisture regime, hydric soils list
OSC 4	-34.2	41	57	A horizon, high organic matter, wet Spodosol, hydric soils list
PAL 3	-19.5	40	73	Muck, high organic matter, Histosol, vertical streaking, hydric soils list
PMR 4	-15.5	57	92	Muck, sulfur smell, high organic matter, Histosol, hydric soils list

(Sheet 1 of 4)

[a] Those sites where wetland hydrology was met were considered "wet sites."

Table 4 (Continued)				
Site Number	Mean Water Table Depth (cm)	Percent Observations		Hydric Soil Indicator
		Water Table Above -15 cm	Water Table Above -30 cm	
Wetland Hydrology Met (Continued)				
PMR 5	-24.4	15	77	Muck, sulfur smell, high organic matter, Histosol, hydric soils list
PMR 6	-24.4	19	74	Muck, sulfur smell, high organic matter, Histosol, hydric soils list
SMT 2	-33.2	11	53	Muck, mucky texture, high organic matter, vertical streaking, wet Spodosol, hydric soils list, A horizon
SMT 3	-3.7	80	89	Muck, high organic matter, Histosol, aquic moisture regime, hydric soils list
THW 3	-19.0	35	93	Muck, sulfur smell, high organic matter, Histosol, aquic moisture regime, hydric soils list
THW 4	-20.0	17	98	Muck, sulfur smell, high organic matter, Histosol, aquic moisture regime, hydric soils list
TRG 1	-28.0	43	60	Muck, sulfur smell, high organic matter, hydric soils list
TRG 2	-30.0	38	57	Muck, A horizon, hydric soils list, sulfur smell, high organic matter, aquic moisture regime
WSR 3	-55.1	50	54	Muck, mucky texture, A horizon, accretions, high organic matter, hydric soils list
WTA 1/3	-12.2	60	65	Muck, mucky texture, stratified layers, high organic matter, wet Spodosol, accretions, hydric soils list
WTA 2/2	-55.0	29	38	Accretions, vertical streaking, oxidized rhizospheres, hydric soils list
WTA 2/3	56.0	92	92	Muck, aquic moisture regime, hydric soils list, high organic matter, Histosol
WTA 2/4	39.8	84	88	Muck, high organic matter, vertical streaking, hydric soils list
WTA 5/2	-79.4	20	20	Accretions, vertical streaking, high organic matter, wet Spodosol
WTA 5/3	42.1	90	92	Muck, high organic matter, aquic moisture regime, hydric soils list, ferrous iron test, histic epipedon
				(Sheet 2 of 4)

Table 4 (Continued)				
Site Number	Mean Water Table Depth (cm)	Percent Observations		Hydric Soil Indicator
		Water Table Above -15 cm	Water Table Above -30 cm	
Wetland Hydrology Marginal[b]				
PMR 2	-36.7	5	30	Muck, sulfur smell, high organic matter, Histosol, hydric soils list
SMT 4	-41.7	5	26	Muck, high organic matter, vertical streaking, wet Spodosol, hydric soils list
THW 2	-37	0	28	Muck, sulfur smell, vertical streaking, hydric soils list, high organic matter, histic epipedon
Wetland Hydrology Not Met[c]				
HHP 1/1	-75.8	0	0	Wet Spodosol
HHP 1/5	-50.1	4	26	A horizon, vertical streaking, high organic matter, hydric soils list
HHP 2/1	-82.5	0	4	Accretions
HHP 2/5	-56.5	0	15	Vertical streaking
MMB 1	-74.6	0	2	—
MMB 4	-79.5	0	0	—
PAL 1	-143.9	0	0	—
PAL 2	-49.1	15	32	Muck, mucky texture, A horizon, accretions, high organic matter, vertical streaking, hydric soils list
PMR 1	-50.0	0	10	Muck, high organic matter, Histosol, hydric soils list
PMR 3	-47.3	2	10	Muck, sulfur smell, high organic matter, Histosol, hydric soils list
PMR 7	-179.3	0	0	—
SMT 1	-54.1	0	10	Muck, A horizon, high organic matter, vertical streaking
THW 1	-125.0	0	0	Wet Spodosol
TRG 3	-78.0	0	0	Mucky texture, A horizon, accretions, high organic matter, wet Spodosol, hydric soils list
TRG 4	-91.0	0	0	Hydric soils list
TRG 5	-68.0	0	10	Wet Spodosol
TRG 6	-148.0	0	0	—
TRG 7	-169.0	0	0	—

[b] Those sites where wetland hydrology was marginal were considered "marginal sites."
[c] Those sites where wetland hydrology was not met were considered "dry sites."

(Sheet 3 of 4)

Table 4 (Concluded)				
Site Number	**Mean Water Table Depth (cm)**	**Percent Observations**		**Hydric Soil Indicator**
		Water Table Above -15 cm	**Water Table Above -30 cm**	
Wetland Hydrology Not Met (Continued)				
WSR 1	-129.7	0	11	A horizon, high organic matter, wet Spodosol
WSR 2	-101.5	19	22	Mucky texture, accretions, high organic matter, vertical streaking, hydric soils list
WSR 4	-93.7	21	21	A horizon, high organic matter, vertical streaking, hydric soils list
WTA 1/1	-127.0	2	10	Hydric soils list
WTA 1/2	-83.2	12	21	Mucky texture, high organic matter, vertical streaking, wet Spodosol, hydric soils list
WTA 2/1	-150.8	0	0	—
WTA 3/1	-99.0	6	10	—
WTA 5/4	-198.3	0	2	—
				(Sheet 4 of 4)

above -15 cm for only 4 percent of the monitoring period. In fact, water table depths at the dry sites were never recorded above -15 cm at 18 of the 26 sites (Table 4).

Hydric Soil Indicators

Of the 58 sandy soils investigated, 84 percent contained one or more hydric soil indicators, and could be classified as hydric using at least one of the hydric soil indicator lists regardless of whether wetland hydrology was recorded at the site or not. The most frequently encountered hydric soil indicators were presence of a surface muck horizon (33 sites), high organic matter (41 sites), and soil series present on the county or NTCHS hydric soils list (41 sites; Table 5). The least frequently occurring hydric soil indicators were stratified layers containing high content of organic material in the upper 5 cm of soil (1 site), oxidized rhizospheres along living roots in the upper 15 cm (1 site), histic epipedon (3 sites), and direct observations of reducing soil conditions using a ferrous iron colorimetric field test (1 site). A polychromatic matrix in the upper 15 cm was never encountered during this field investigation.

Table 5
Number of Times Each Hydric Soil Indicator Was Present and Frequency of Occurrence[a] for Each Hydrology Classification

Hydric Soil Indicator	Wetland Hydrology Met[b] ("wet sites")		Wetland Hydrology Marginal ("marginal sites")		Wetland Hydrology Not Met ("dry sites")		Sample Size
	No. of Sites	Percent Occurrence	No. of Sites	Percent Occurrence	No. of Sites	Percent Occurrence	
Regional and Florida Soils Lists							
Muck Surface	26	79	3	9	4	12	33
Mucky Texture	4	57	0	0	4	50	8
A Horizon	4	40	0	0	6	60	10
Organic Accretions	5	56	0	0	4	44	9
Sulfur Smell (0 to 30 cm)	11	79	2	14	1	7	14
Stratified Layers	1	100	0	0	0	0	1
Oxidized Rhizopheres	1	100	0	0	0	0	1
1987 and 1989 Manuals							
High Organic Matter	28	68	3	7	10	24	41
Histosol	15	83	1	6	2	11	18
Histic Epipedon	2	67	1	33	0	0	3
Sulfur Smell (0 to 30 cm)	11	79	2	14	1	7	14
Wet Spodosol	6	50	1	8	6	46	13
Hydric Soils List	28	68	3	7	10	24	41
Aquic Moisture Regime	15	100	0	0	0	0	15
Vertical Streaking	5	36	2	14	7	50	14
Ferrous Iron Test	1	100	0	0	0	0	1
Number of Sites	29		3		26		

[a] Calculated as the number of sites where a specific indicator was present divided by the total number of occurrences of the indicator.
[b] Water table is at or above 30 cm below ground surface for soils containing an organic horizon ≥7.5 cm thick, or 15 cm below ground surface for soils with an organic horizon <7.5 cm thick or for soils lacking an organic horizon, for two consecutive monthly monitoring events during the growing season for either 2 out of 3 years, 2 out of 4 years, or 3 out of 5 years, depending on the existing hydrologic record.

Several hydric soil indicators occurred at the wet sites more frequently than at the marginal or dry sites, suggesting that they were more reliable predictors of wetland hydrology. The indicators that occurred at the wet sites at least 70 percent of the time (excluding indicators where n = 1) included a muck surface horizon, sulfur smell, Histosol, and aquic moisture regime (Table 5). Sites where any one of these four indicators was present had significantly higher exceedance frequencies for one or more critical water table depths than did sites where the indicator was absent (Table 6).

Table 6
Comparison of Exceedance Frequencies of Critical Water Table Depths For Groups of Sites Defined by Presence or Absence of a Hydric Soil Indicator

Hydric Soil Indicator	Water Table At or Above Ground Surface	Water Table At or Above -15 cm	Water Table At or Above - 30 cm	Water Table Between 0 and -15 cm	Water Table Between - 15 and -30 cm	Standard Deviation of the Water Table Depth[d]
Regional and Florida Soils Lists						
Muck Surface (n=33)[a]	+[b]	+	+	+	+	L
Mucky Texture (n=8)	NS	NS	NS	NS	NS	H
A Horizon (n=10)	NS	NS	NS	NS	NS	H
Organic Accretions (n=9)	NS	NS	NS	NS	NS	H
Sulfur Smell (n=14)[c]	NS	NS	+	NS	+	L
1987 and 1989 Manuals						
High Organic Matter (n=41)	+	+	+	+	+	L
Histosol (n=18)	NS	+	+	+	+	L
Histic Epipedon (n=3)	NS	NS	NS	NS	NS	NS
Vertical Streaking (n=14)	NS	NS	NS	NS	NS	NS
Wet Spodosol (n=13)	NS	NS	NS	NS	NS	NS
Hydric Soils List[c] (n=41)	+	+	+	+	+	L
Sulfur Smell (n=14)	NS	NS	+	NS	+	L
Aquic Moisture Regime (n=15)	+	+	+	+	+	NS

[a] n = number of sites (out of 58) where indicator was present.
[b] + = exceedance frequencies were significantly ($p<0.05$) higher at sites where hydric soil indicator was present.
[c] Only on the Florida indicator list.
[d] Standard deviation of the water table depth was significantly ($p<0.05$) lower (L) or higher (H) at sites where an indicator was present; NS = not significantly different.
NS = exceedance frequencies were not significantly ($p>0.05$) different.

Each of the three marginal sites had either five or six different hydric soil indicators (Table 4). However, the small sample size for this group made it difficult to identify unique indicators for marginal wetland sites. When marginal sites were grouped with wet sites, high organic matter content, histic epipedon, and soils on the hydric soils list became stronger hydric soil indicators (Table 5). Sites where high organic matter or soils on the hydric soils list were present had significantly higher exceedance frequencies at all of the critical water table depths than sites where these indicators were absent (Table 6). However, water table exceedance frequencies for the three soils with a histic epipedon were not significantly higher than exceedance frequencies for soils without this indicator.

The dry sites had between zero and seven hydric soil indicators (Table 4). A thick dark A horizon occurred on 60 percent of the dry sites, and consequently was not a good predictor of wetland hydrology (Table 5). Mucky texture, organic accretions, wet Spodosol, and vertical streaking were also poor predictors of wetland conditions because they occurred with almost equal frequency at both wet and dry sites. Exceedance frequencies of water tables above critical depths were not significantly greater at sites with a mucky texture, thick dark A horizon, organic accretions, vertical streaking, or wet Spodosol (Table 6).

Paired indicators offered little additional predictive power for identifying wetland hydrology. One exception was the combination of a muck surface horizon and organic accretions. When analyzed separately, organic accretions showed no significant relationship between exceedance frequency and critical water table depths. However, when organic accretions and surface muck horizon were combined, they were more frequently associated with a water table at or above ground surface.

4 Discussion

Our analysis of hydric soil indicators was based on the assumptions that (a) precipitation and thus water levels were "normal" during the period of groundwater measurements, (b) established wells accurately measured the level of the shallow water table, and (c) no recent changes in regional groundwater levels had occurred due to anthropogenic causes (e.g., groundwater pumping). Precipitation at nearby NOAA weather stations was within 10 percent of normal precipitation during most years of study. However, a rainfall deficit occurred for all years in which precipitation data were available at Crescent City and Avon Park (Table 3). This rainfall deficit presumably affected the water table depth at these sites.

As a follow-up to this study, researchers at USAE Waterways Experiment Station installed shallow wells adjacent to some of the existing primary wells.[1] Preliminary findings suggest that the water level measurements in the deeper primary wells were often lower than in adjacent paired shallow wells (where present), indicating that the primary wells may have overestimated the depth of the surface water table. The largest discrepancies occurred when the water level was deeper than the critical depths. In light of these observations, we suspect that closer agreement between hydrology and hydric soil indicators would have occurred if continuous precipitation deficits had not occurred at some study sites, and if the primary wells had not overestimated the water table depth.

Regional and Florida Indicator Lists

Desirable attributes of a hydric soil indicator are (a) technical validity, i.e., the indicator is present only under wetland conditions rather than over a wide range of hydrologic regimes; (b) seasonal stability, i.e., the indicator is consistently present regardless of current (seasonal) hydrologic conditions; (c) ease of detection; and (d) lack of subjectivity involved in identification. The most reliable predictors of wetland hydrology on the regional and Florida

[1] Personal communication, M. Davis.

lists were a layer of peat,[1] muck, or mucky peat and, for the Florida list, presence of sulfidic material (rotten egg odor) in the upper 30 cm. A muck surface horizon typically develops under frequent and extended saturation where decomposition of organic matter is impeded by an anaerobic environment (Megonigal, Patrick, and Faulkner 1993). These organic surface horizons characteristically occur on the topographically lowest landforms (Coultas and Calhoun 1976; Coultas, Clewell, and Taylor 1979). Unlike hydrogen sulfide, a muck, peat, or mucky peat horizon can be consistently identified in the field regardless of the current hydrologic or oxidation/reduction environment. In addition, an organic horizon is easily recognized by field investigators without extensive training in soil science.

Extended anaerobiosis, such as that found in tidal marsh systems, is required to reduce sulfate, thus producing hydrogen sulfide with its characteristic rotten egg odor (Gambrell and Patrick 1978). Although the smell of hydrogen sulfide is a pedogenetically sound hydric soil indicator in that it develops over an extended period of saturation or inundation, it can vary seasonally as the soil's redox status changes. Redox potentials fluctuate as water tables rise and fall (Faulkner and Patrick 1992, Megonigal, Patrick, and Faulkner 1993); therefore, this hydric soil indicator will often be absent during the dry season when the water table drops for extended periods of time. In the dry season only the wettest soils may exhibit a hydrogen sulfide smell. However, we have noted many times that hydrogen sulfide odor is often the only indicator present in coastal salt marshes.

Mucky texture, organic matter accretions in the upper 15 cm, and a thick dark A horizon[2] were associated less frequently with wetland hydrology. Mucky textured horizons tended to occur in landscape positions intermediate between low-lying depressions with organic soils, and higher areas with thick dark A horizons. Consequently, the amount of organic matter in a mucky textured horizon was intermediate between a muck horizon and a thick dark A horizon. A mucky textured horizon is considered by many soil scientists to be a relatively strong indicator of anaerobiosis. However, in this study, a mucky texture occurred with almost equal frequency at both the wet and dry sites. In addition, exceedance frequencies of soils with mucky textured horizons were not significantly different from those of other soil profiles. A mucky textured horizon occurred at four dry sites; however, three of the four dry sites (PAL2, WSR2, and WTA 1/2) had among the highest water table readings. We suspect that mucky texture may have been a more reliable indicator of wetland hydrology if the sample size (n=8) had been larger.

Organic accretions were poor indicators of wetland conditions because they were detected with equal frequency at wet and dry sites. Organic accretions are small clumps or balls of organic matter that occur in a mineral horizon

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[1] A peat, muck, or mucky peat layer of any thickness if no root or leaf mat is present, or at least 1 cm thick if a root or leaf mat is present.

[2] Surface layer 10 cm or more thick, with a color value of 3 or less and a chroma of 1 or less, and at least 70 percent of the sand grains coated or covered with organic matter.

and are often associated with plant roots. By virtue of their location, organic accretions are composed of, or at least surrounded by, some mineral particles. Field determination was difficult because of uncertainty about the allowable dimensions and mineral content of an organic accretion. Because organic accretions occur in mineral horizons, they were not documented in the wettest areas where organic surface horizons occurred. In this study, organic accretions were most commonly detected in transitional wetlands where the water table frequently fluctuated, as indicated by the significantly higher standard deviation of water table measurements for soils with this feature (Table 6).

Thick dark A horizons were considered poor indicators of wetland hydrology because they were found at dry sites more often than at wet sites (Table 4). Soils with thick dark A horizons are typical of low-lying flatwood communities. Although these flatwood soils often perch water following extended rain events, the sandy nature of the surface and subsurface horizons favors both downward and lateral water movement. Therefore, water tables fluctuate more in these soils than in their more mucky or clayey counterparts (Nichols, Collins, and Hurt. 1990). In this study, standard deviation of the water table was high in soils with thick dark A horizons (Table 6). In contrast to our findings, Kuehl[1] is finding in an on-going project that a thick dark A horizon is the best hydric soil indicator present in low-lying flatwoods just outside cypress domes where water flows from one dome to another.

Thick dark A horizons were difficult to identify in the field despite the fact that candidates for this hydric soil indicator have a distinctive "salt and pepper" appearance. However, for 70 percent of the sand grains to be coated or covered with organic matter, the "pepper" color must exceed the "salt" color. We found that different soil scientists often disagreed in their estimates of percent of soil particles covered or coated with organic matter. This disagreement suggests that making a hydric soil determination based solely on the presence of a thick dark A horizon is a subjective decision. This hydric soil indicator was found significantly more often at sites that lacked rather than possessed wetland hydrology, and its identification is subjective in interpretation. Although our results may be conservative due to over-estimated water table depths, we conclude that application of this indicator should be made with caution.

1987 and 1989 Manuals

The 1987 and 1989 Manuals listed six hydric soil indicators that reliably predicted wetland hydrology. Two of the six indicators, Histosol and histic epipedon, are redundant expressions of surface organic matter accumulation. Histosol (at least 40 cm of organic matter) and histic epipedon (20 to 40 cm of

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[1] Personal communication, Kuehl.

organic matter) have thickness criteria established by Soil Taxonomy (USDA Soil Survey Staff 1975).

High organic matter content was not considered to be a strong indicator of hydric soils because it is so vague in its description. The 1987 and 1989 Manuals provided no guidance as to what constitutes high organic matter, so this attribute was arbitrarily assigned to soils that had surface horizons of muck, mucky sand, histic epipedon, Histosol, thick dark A horizons, or organic accretions. The feature has a strong pedogenetic basis for inclusion as a hydric soil indicator, but it is not defined specifically enough to be useful in the field. The USDA SCS lists of sandy soil indicators address this problem by defining more quantitatively what features can be used to identify "high organic matter content" in the field.

To eliminate both the redundancy of these three indicators and the subjectivity of determining high organic matter, we suggest replacing Histosol, histic epipedon, and high organic matter with the following indicator: an organic surface horizon at least 1 cm thick if a root or leaf mat is present, or any thickness in the absence of a root or leaf mat. We assume that a soil has been disturbed if a root or leaf mat is absent. Thus, an organic horizon (muck, peat, or mucky peat) of any thickness is sufficient to identify a hydric soil under disturbed conditions. This indicator is used in the regional and Florida hydric soil lists to define organic matter accumulation and was a reliable indicator in our study.

Soils present on the county or NTCHS hydric soils list was a strong predictor of wetland hydrology. Soil phases in our study were checked for presence on the county or NTCHS lists of hydric map units. If a soil was on either list, the pedon was classified to the series level by two cooperating SCS soil scientists. There were often discrepancies in the selected series because many profile descriptions did not fit within the range of characteristics allowed by the official series description of any soil mapped in the region. Therefore, many of the soils were recorded as soil taxadjuncts. The usefulness and accuracy of the county or NTCHS hydric soils list for making hydric soil determinations was limited due to the complexity of identifying a soil to the series level, and by the variability of soils in the field. Although this indicator was a reliable predictor of wetland hydrology when taxadjuncts were allowed, it should be used only by locally experienced soil scientists.

The use of "aquic moisture regime" as a hydric soil field indicator has been a source of uncertainty for users of the 1987 and 1989 Manuals. "Aquic moisture regime," as defined in Soil Taxonomy (USDA Soil Survey Staff 1975), is not useful as a field indicator during routine wetland delineations because of the need for extensive information regarding soil redox potentials and water tables, and by internal contradictions that have caused the USDA SCS to replace the aquic moisture regime with aquic conditions in the latest edition of the Keys to Soil Taxonomy (Soil Survey Staff 1992). Furthermore, it cannot be assumed that all soils in aquic suborders are hydric soils because most Aeric subgroups are nonhydric. The USACE has cautiously interpreted

"aquic moisture regime" to be the presence of free water tables in, or inundation on, the soil such that the hydric soil hydrologic depth criteria are met and one has strong reason to believe that the water levels would stay above the critical depth for 2 weeks during the growing season (1 week for inundation) in most years. This requires professional judgment. Responsibly used, the "aquic moisture regime" indicator allows delineators to meet the hydric soil parameter when water tables are close to or above the soil surface for long durations and soils do not have other hydric soil indicators.

The least reliable hydric soil indicators in the 1987 and 1989 Manuals were vertical streaking in subsurface horizons and wet Spodosols. Vertical streaking is thought to result from organic matter partially leaching through the soil along zones of weakness as the water table fluctuates. Vertical streaking occurs to a greater degree in sandy soils containing high organic matter (1987 Manual). It was difficult to decide what constituted vertical streaking as it could be confused with gradual or diffuse horizon boundaries. Because it was common even at the driest sites, fluctuation of the water table may cause development of vertical streaking rather than continuous inundation or saturation.

The 1987 and 1989 Manuals define a wet Spodosol as a sandy soil with a spodic horizon between depths of 30 and 75 cm, a thick dark surface horizon, and a dull gray E horizon. The vague requirement for color or thickness of the A and E horizons resulted in subjectivity regarding which soils were wet Spodosols. In addition, Florida SCS soil scientists have found spodic horizons at different profile depths even under similar hydrologic conditions (Watts and Stankey 1980); thus the 30- to 75-cm depth criterion is not reflective of hydrologic conditions. Wet Spodosols were poor predictors of hydric soil hydrology because their identification is subjective and they occurred with almost equal frequency at both wet and dry sites.

A colorimetric ferrous iron test was conducted at several sites by adding a few drops of α,α'-dipyridyl to the soil. A pink color resulted when ferrous iron was present. Although the test was applied only to soils that were flooded and presumably reduced, only one positive result was obtained. The poor performance of the ferrous iron test was attributed to low iron content typical of many Florida sandy soils and dry conditions at the time of sampling. The 1989 Manual acknowledges this limitation and cautions against using the colorimetric test in sandy or organic soils.

5 Conclusions

Although strong and weak predictors of wetland hydrology were identified, there was incomplete agreement between those sites that contained hydric soil indicators, and those that exhibited wetland hydrology. One reason for the discrepancies may have been that water table data gathered for this study may have overestimated long-term average depths. While mean rainfall for the study period was within 10 percent of normal precipitation, annual rainfall deficit at some sites reached 28 percent below normal. Presumably this rainfall deficit contributed to low water tables, adding to the overestimation of water table depth in the wells and the overly conservative estimates of wetland hydrology.

The list of indicators in the 1987 and 1989 Manuals resulted in 16 soils being classified as hydric that apparently lacked wetland hydrology. Application of the Florida and South Region SCS lists resulted in 11 soils being classified hydric that lacked wetland hydrology during the period of record. Clearly, the Florida and South Regional SCS lists are in closer agreement with our findings than are the practices stipulated in the 1987 and 1989 Manuals.

Our data suggest that for sandy soils, the Florida and South Regional SCS lists should replace the hydric soil indicator lists of the 1987 or 1989 Manual. Histosol, histic epipedon, sulfur odor, hydric soils list, and aquic moisture regime all reliably predicted wetland hydrology. The first three indicators, Histosol, histic epipedon, and sulfur odor, are all included on the Florida or South Regional SCS lists. (An organic horizon at least 1 cm thick includes histic epipedons and all Histosols.) The identification of soils on the county or NTCHS hydric soils list as a hydric soil indicator should be amended to allow inclusion of taxadjuncts, but require evaluation by a locally experienced professional soil scientist. Aquic moisture regime should be used only when water tables are observed within 15 cm of the ground surface and probably recur in most years for long duration.

To improve on the Florida and South Regional SCS lists, we suggest weakening the emphasis on the two indicators, dark A horizon and organic accretions. Neither of these indicators alone was a reliable predictor of wetland hydrology in this study.

Although a voluminous set of hydrology data was analyzed, 2 to 5 years of hydrologic information is only a moment in geologic history. Hydric soil features develop over periods of decades and centuries and exhibit characteristics indicative of long-term hydrologic conditions. Thus, results of this study are based on extracting a relatively minute amount of hydrologic information from a narrow window in pedologic time.

Comparing hydric soil indicators with long-term hydrologic records along upland-to-wetland transects can provide valuable insight for distinguishing morphological features that reliably predict hydric soil hydrology. Because soils reflect long-term hydrology, they are a necessary part of wetland jurisdictional decisions, especially in areas where vegetation has been altered. This study has provided an initial examination of relationships between hydric soil indicators and hydrology in Southeastern Coastal Plain sandy soils. Additional research is warranted, including more detailed measurements on wetland hydrology.

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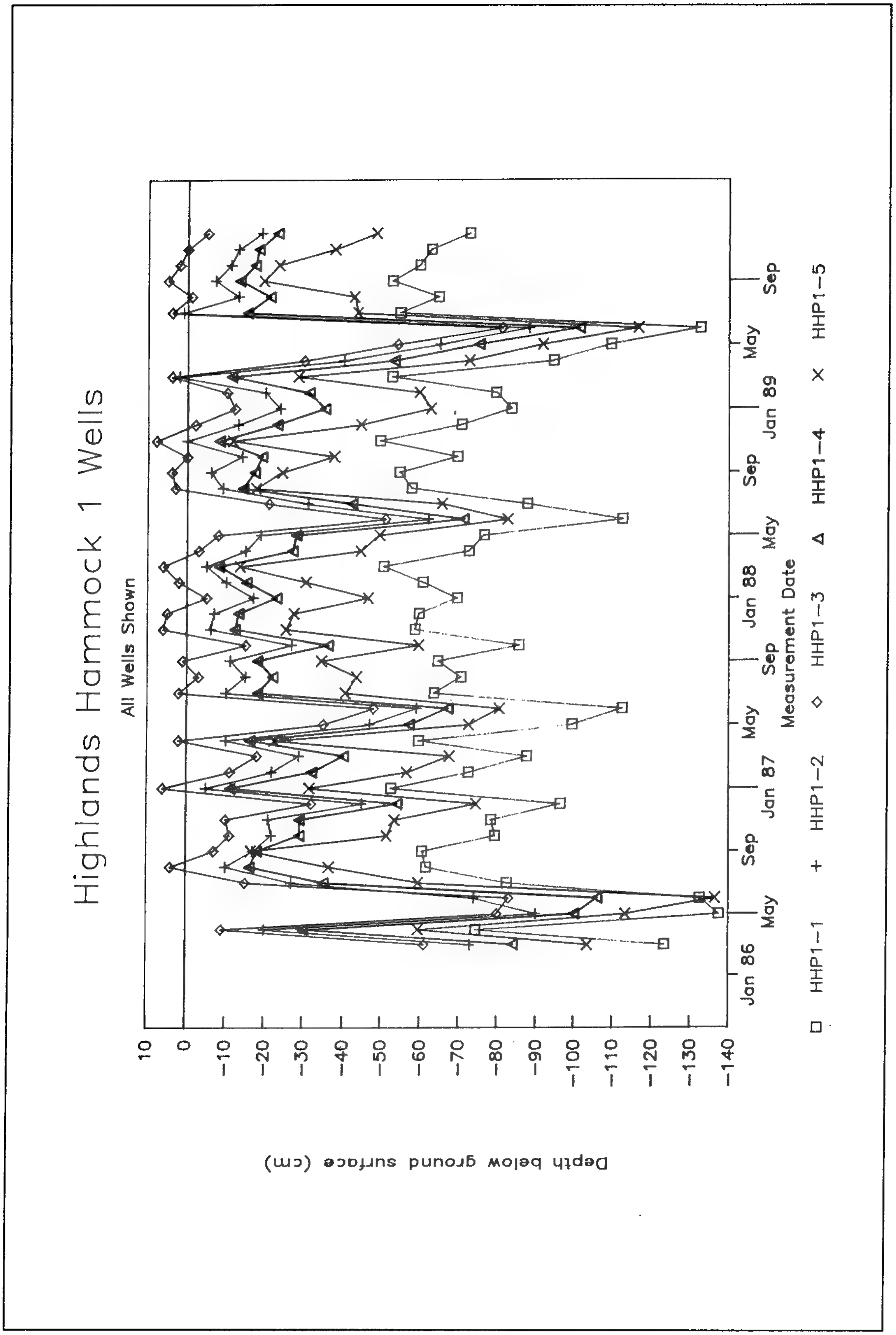
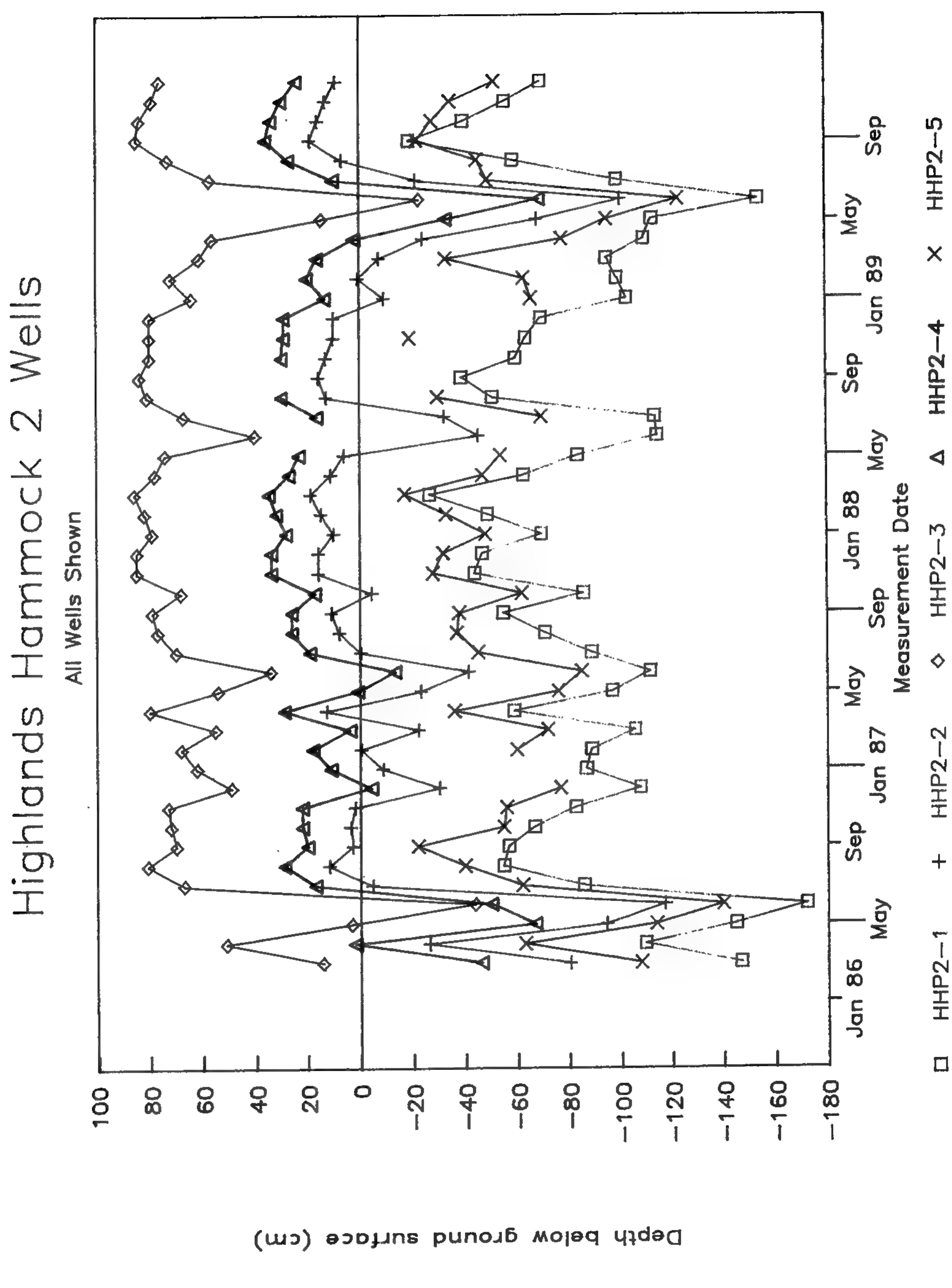
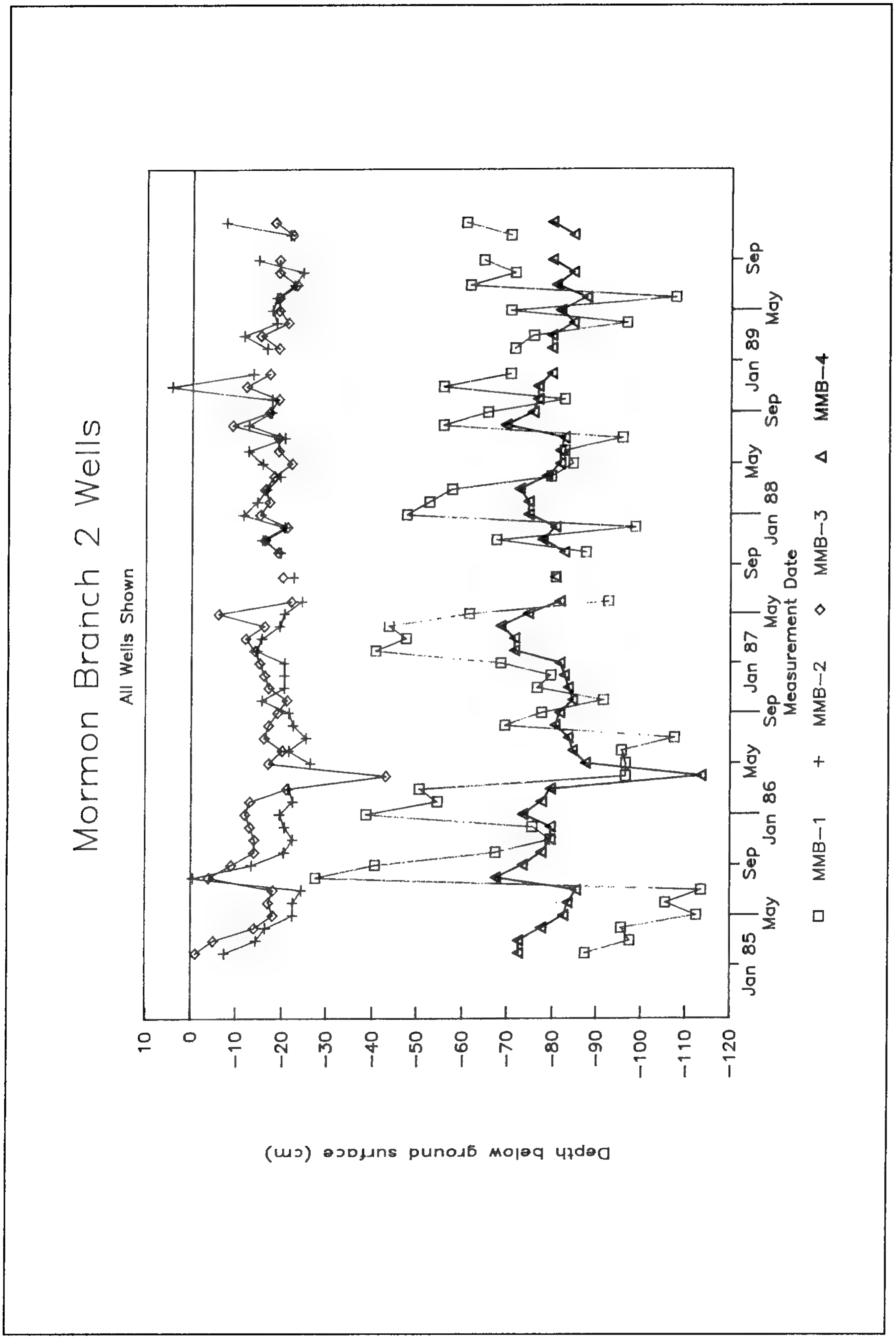
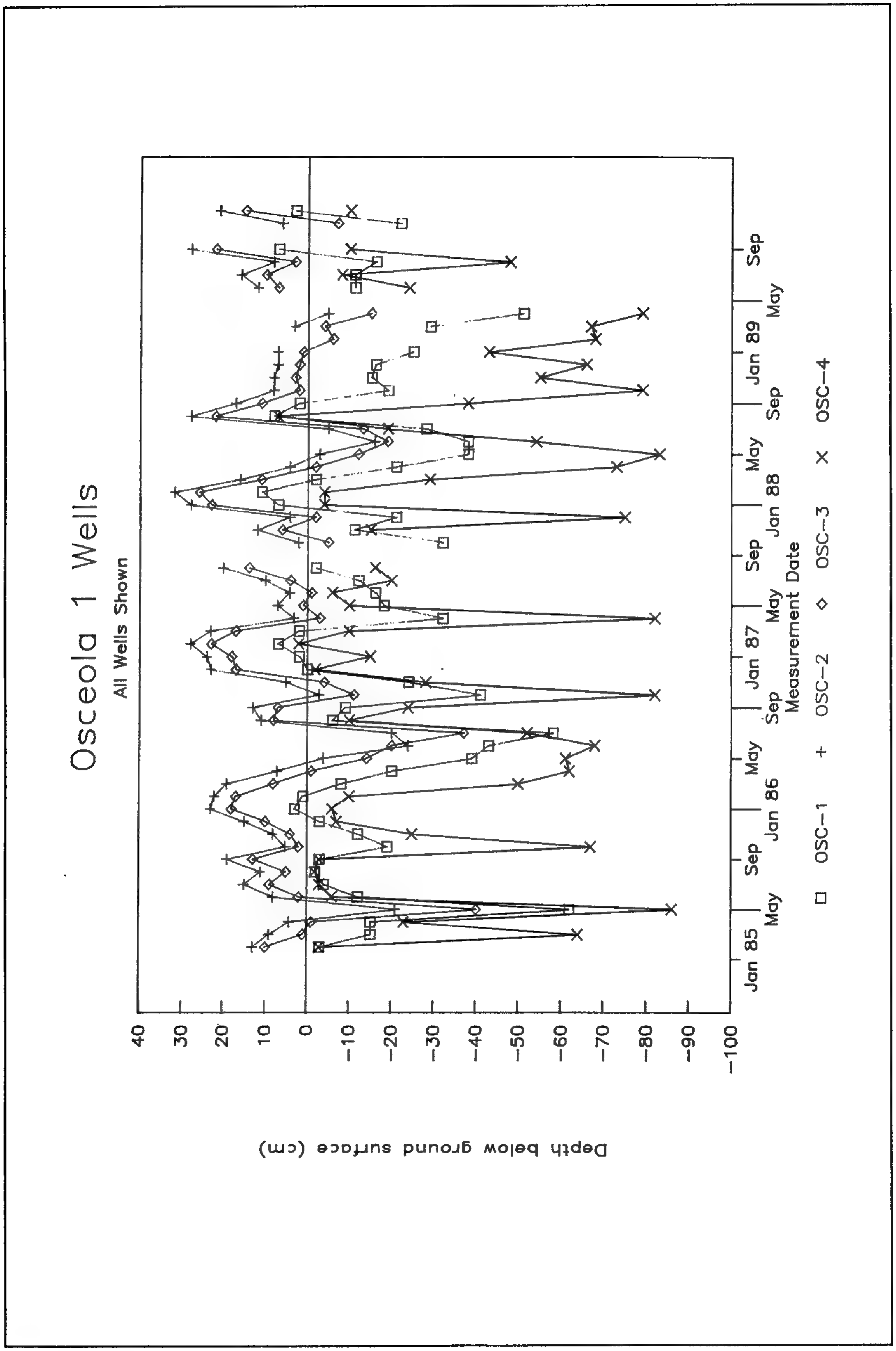
Appendix A
Hydrographs

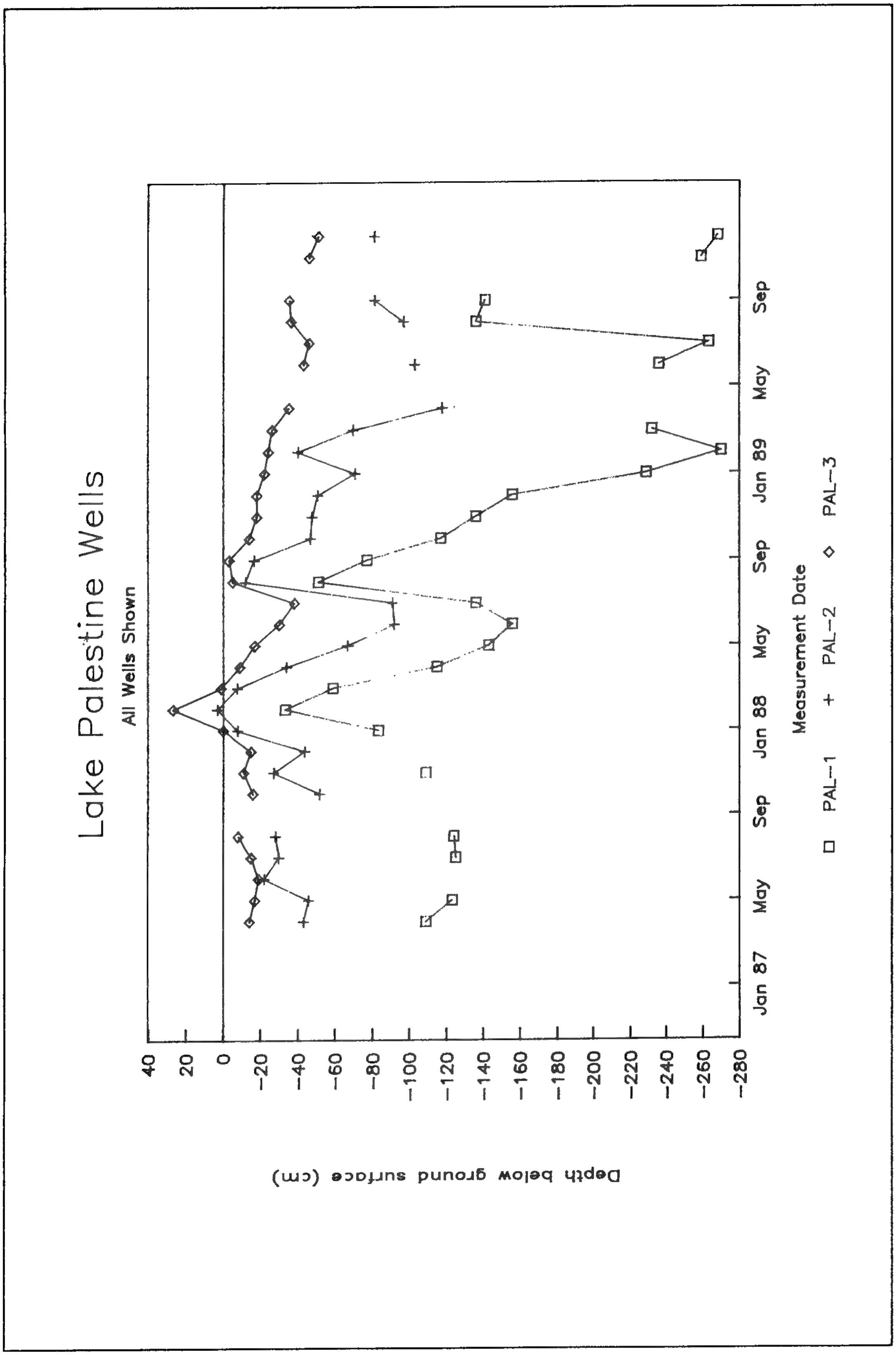

Highlands Hammock 1 Wells
All Wells Shown
Depth below ground surface (cm)
10
0
−10
−20
−30
−40
−50
−60
−70
−80
−90
−100
−110
−120
−130
−140
Jan 86
May
Sep
Jan 87
May
Sep
Jan 88
May
Sep
Jan 89
May
Sep
Measurement Date
□ HHP1−1
+ HHP1−2
◇ HHP1−3
Δ HHP1−4
× HHP1−5

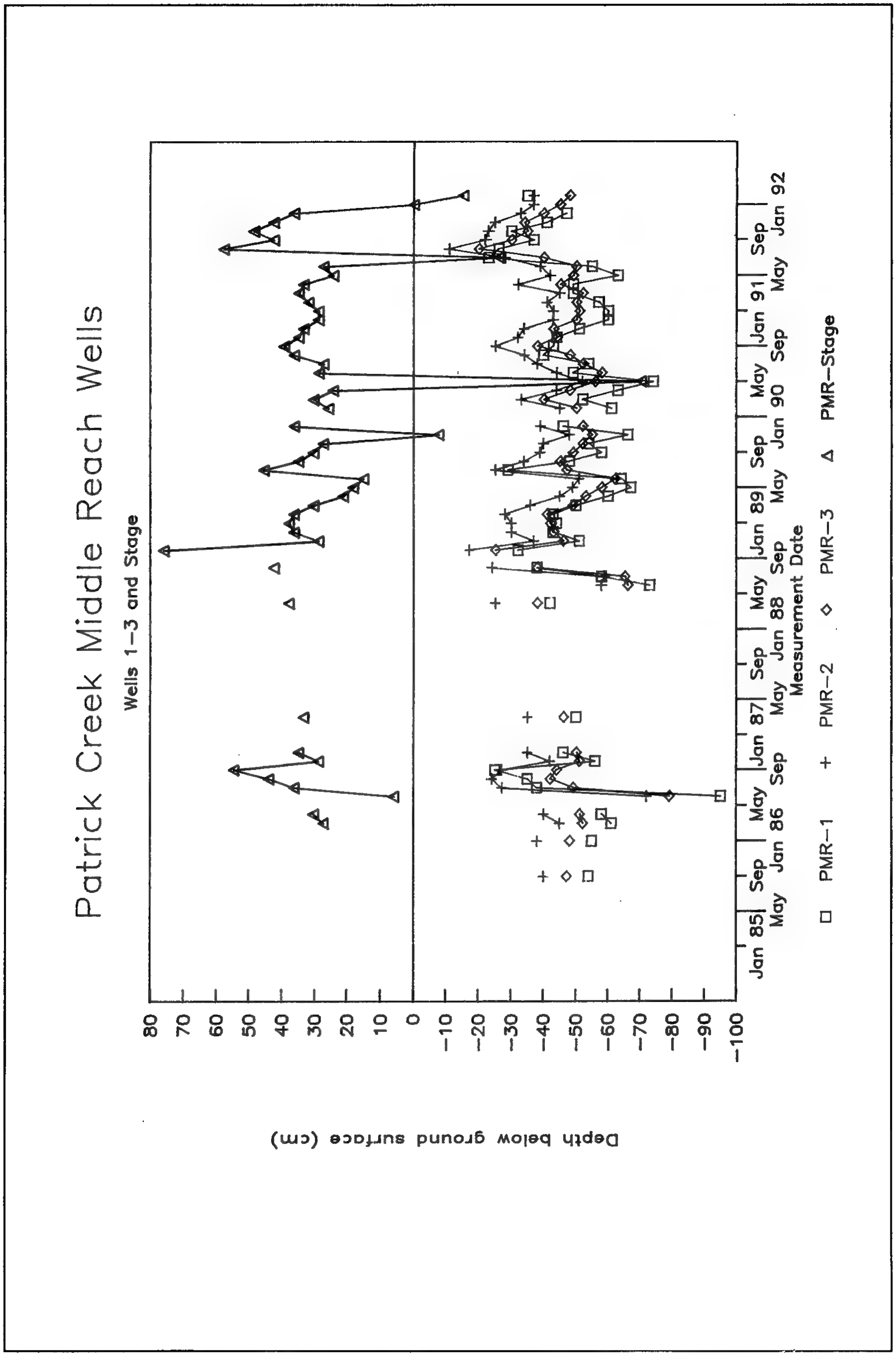

Highlands Hammock 2 Wells
All Wells Shown
Depth below ground surface (cm)
100
80
60
40
20
0
−20
−40
−60
−80
−100
−120
−140
−160
−180
Jan 86
May
Sep
Jan 87
May
Sep
Jan 88
May
Sep
Jan 89
May
Sep
Measurement Date
□ HHP2−1
+ HHP2−2
◇ HHP2−3
Δ HHP2−4
× HHP2−5



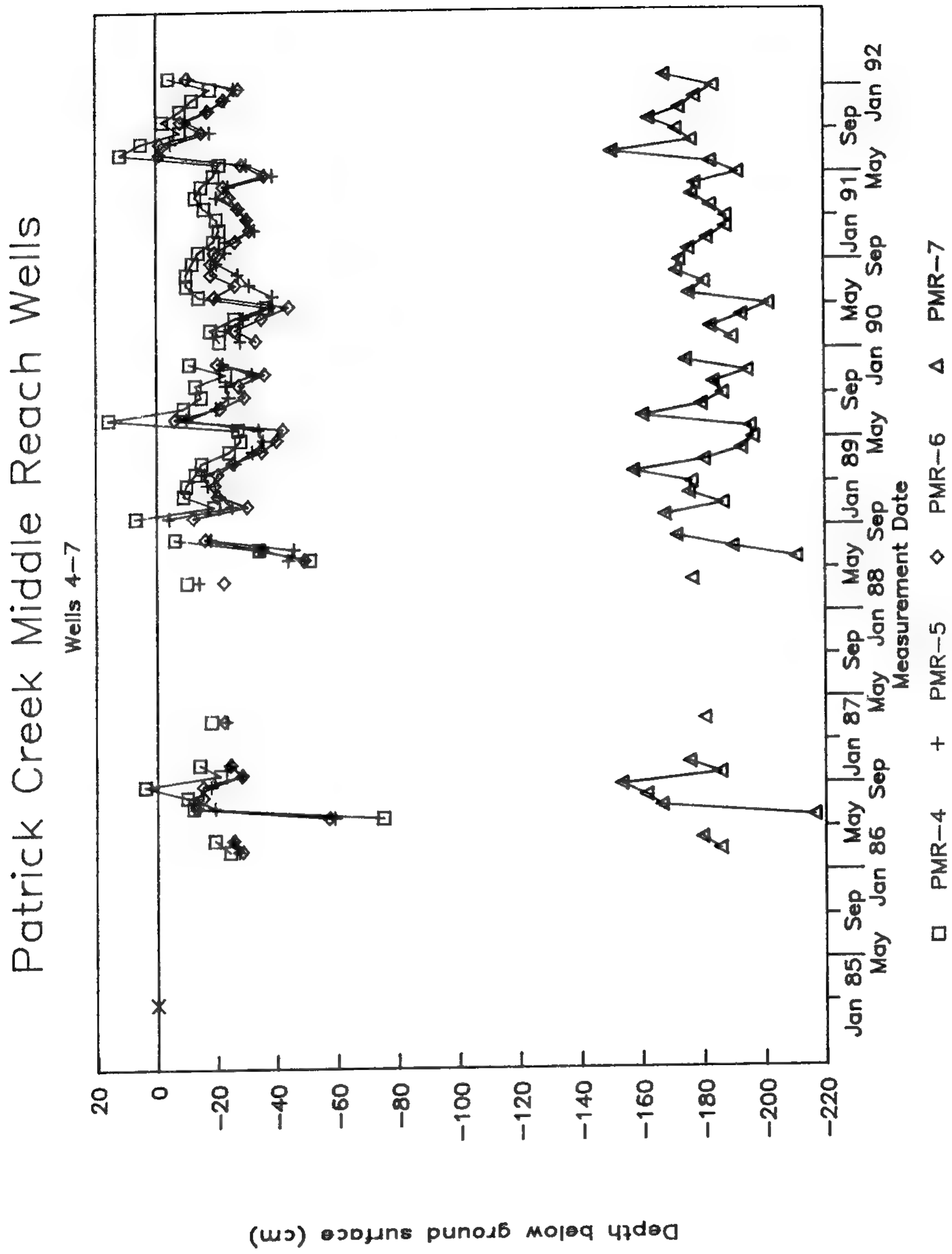
Mormon Branch 2 Wells
All Wells Shown
Depth below ground surface (cm)
10
0
−10
−20
−30
−40
−50
−60
−70
−80
−90
−100
−110
−120
Jan 85
May
Sep
Jan 86
May
Sep
Jan 87
May
Sep
Jan 88
May
Sep
Jan 89
May
Sep
Measurement Date
MMB−1
MMB−2
MMB−3
MMB−4


Osceola 1 Wells
All Wells Shown
Depth below ground surface (cm)
40
30
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
Jan 85
May
Sep
Jan 86
May
Sep
Jan 87
May
Sep
Jan 88
May
Sep
Jan 89
May
Sep
Measurement Date
OSC-1
OSC-2
OSC-3
OSC-4

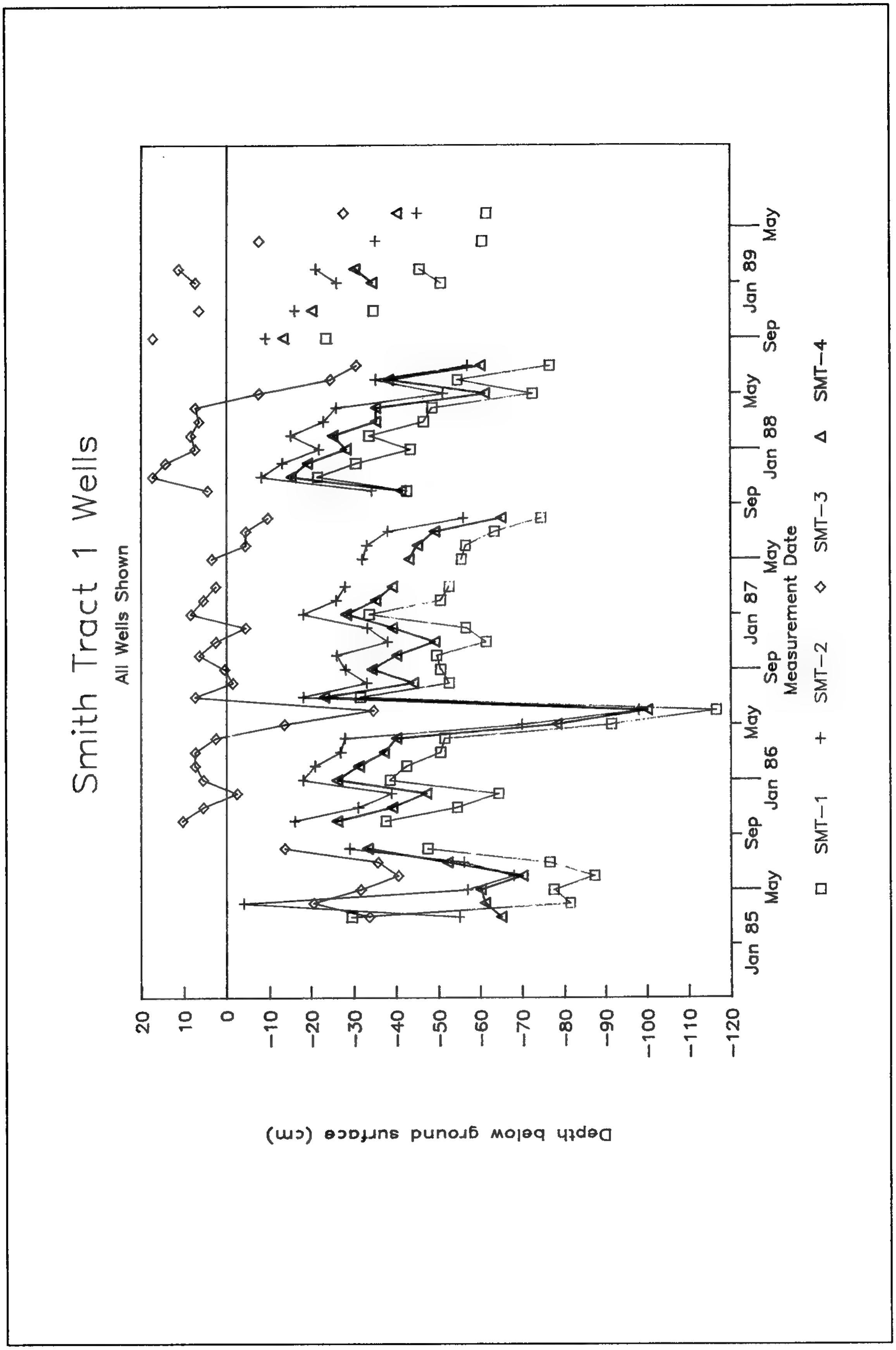

Lake Palestine Wells
All Wells Shown
Depth below ground surface (cm)
40
20
0
-20
-40
-60
-80
-100
-120
-140
-160
-180
-200
-220
-240
-260
-280
Jan 87
May
Sep
Jan 88
May
Sep
Jan 89
May
Sep
Measurement Date
PAL-1
PAL-2
PAL-3

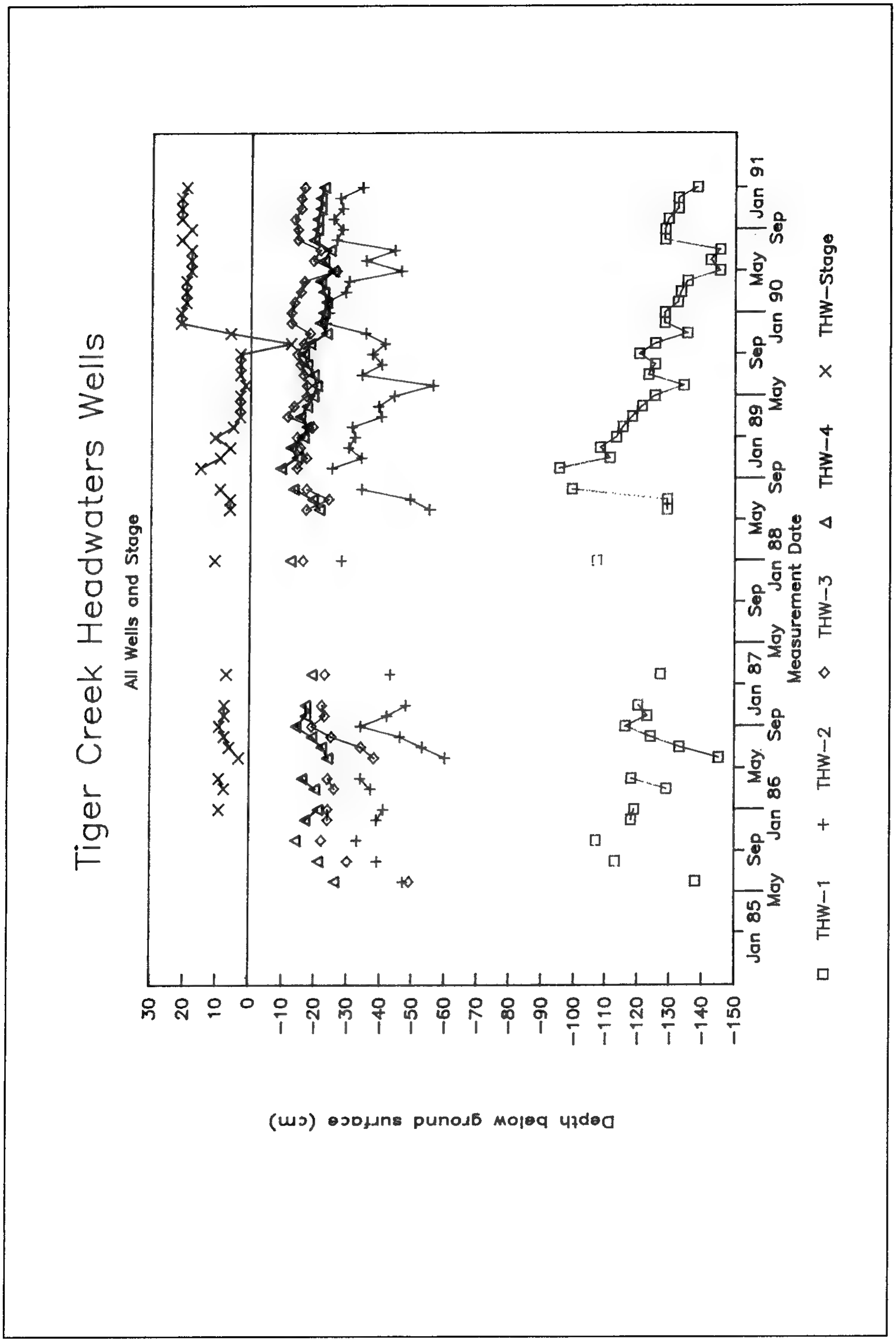


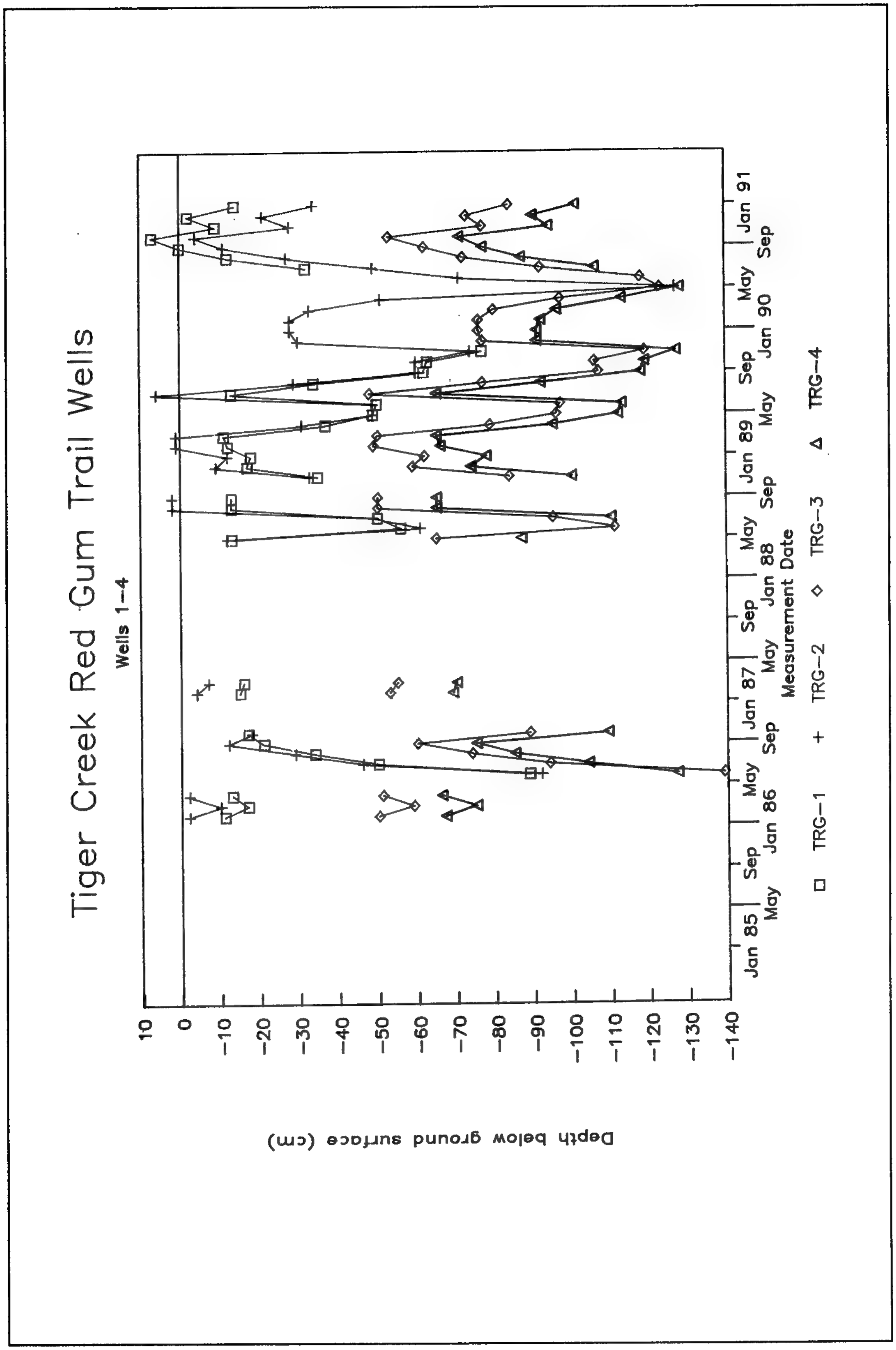
Patrick Creek Middle Reach Wells
Wells 1–3 and Stage
Depth below ground surface (cm)
80
70
60
50
40
30
20
10
0
–10
–20
–30
–40
–50
–60
–70
–80
–90
–100
Jan 85
May
Sep
Jan 86
May
Sep
Jan 87
May
Sep
Jan 88
May
Sep
Jan 89
May
Sep
Jan 90
May
Sep
Jan 91
May
Sep
Jan 92
Measurement Date
PMR–1
PMR–2
PMR–3
PMR–Stage

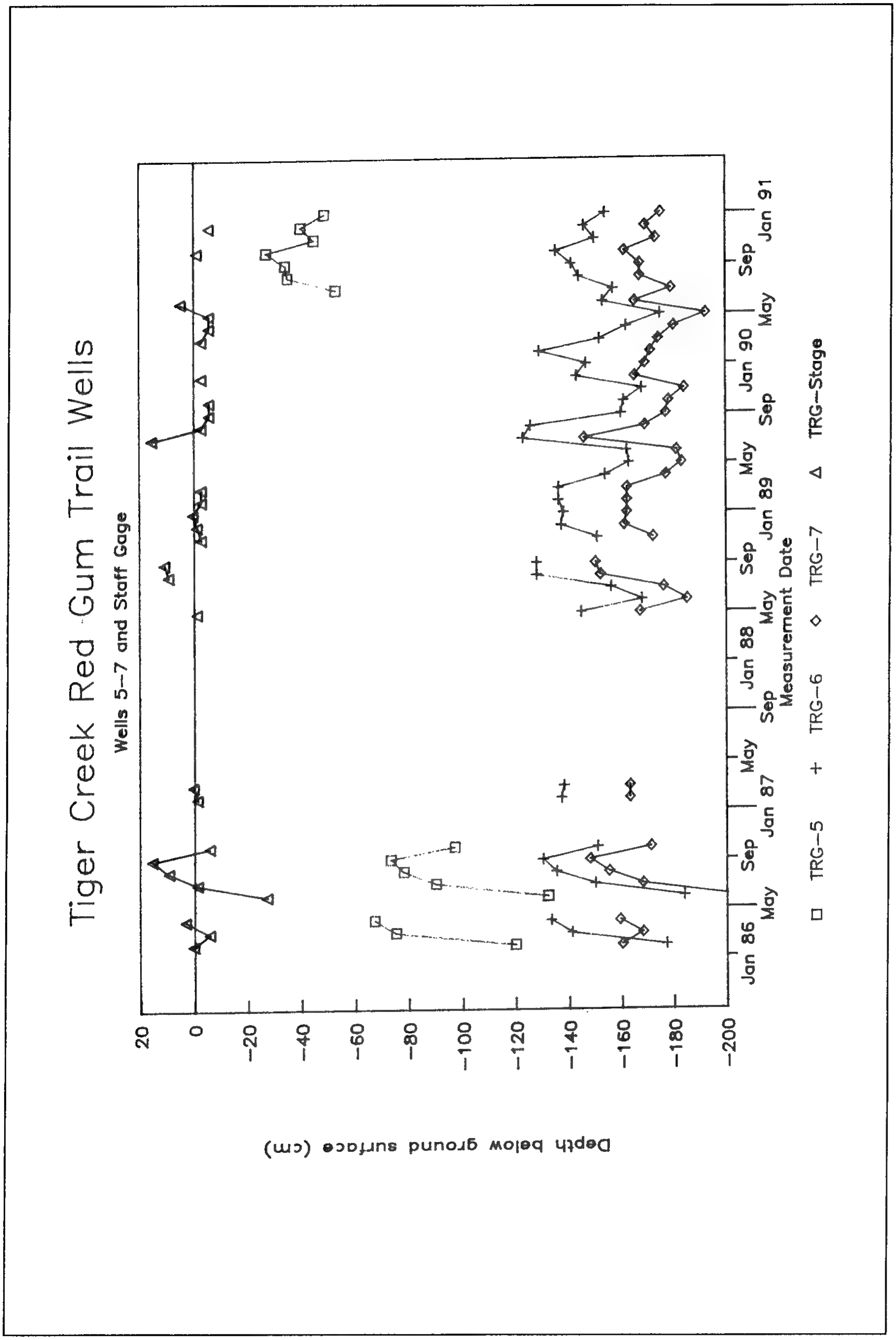


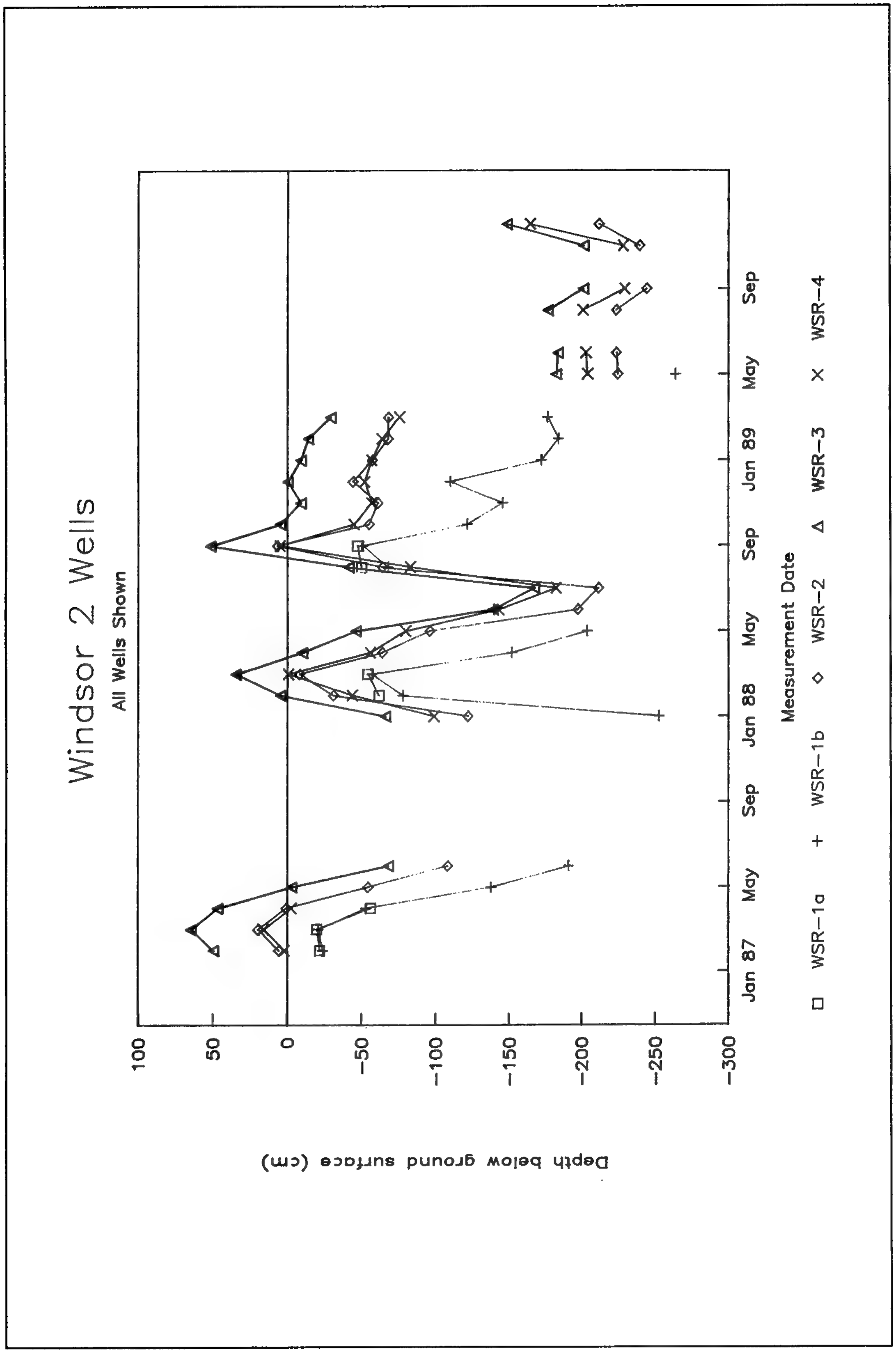
Patrick Creek Middle Reach Wells
Wells 4–7
Depth below ground surface (cm)
20
0
−20
−40
−60
−80
−100
−120
−140
−160
−180
−200
−220
Jan 85
May
Sep
Jan 86
May
Sep
Jan 87
May
Sep
Jan 88
May
Sep
Jan 89
May
Sep
Jan 90
May
Sep
Jan 91
May
Sep
Jan 92
Measurement Date
□ PMR–4
+ PMR–5
◇ PMR–6
△ PMR–7

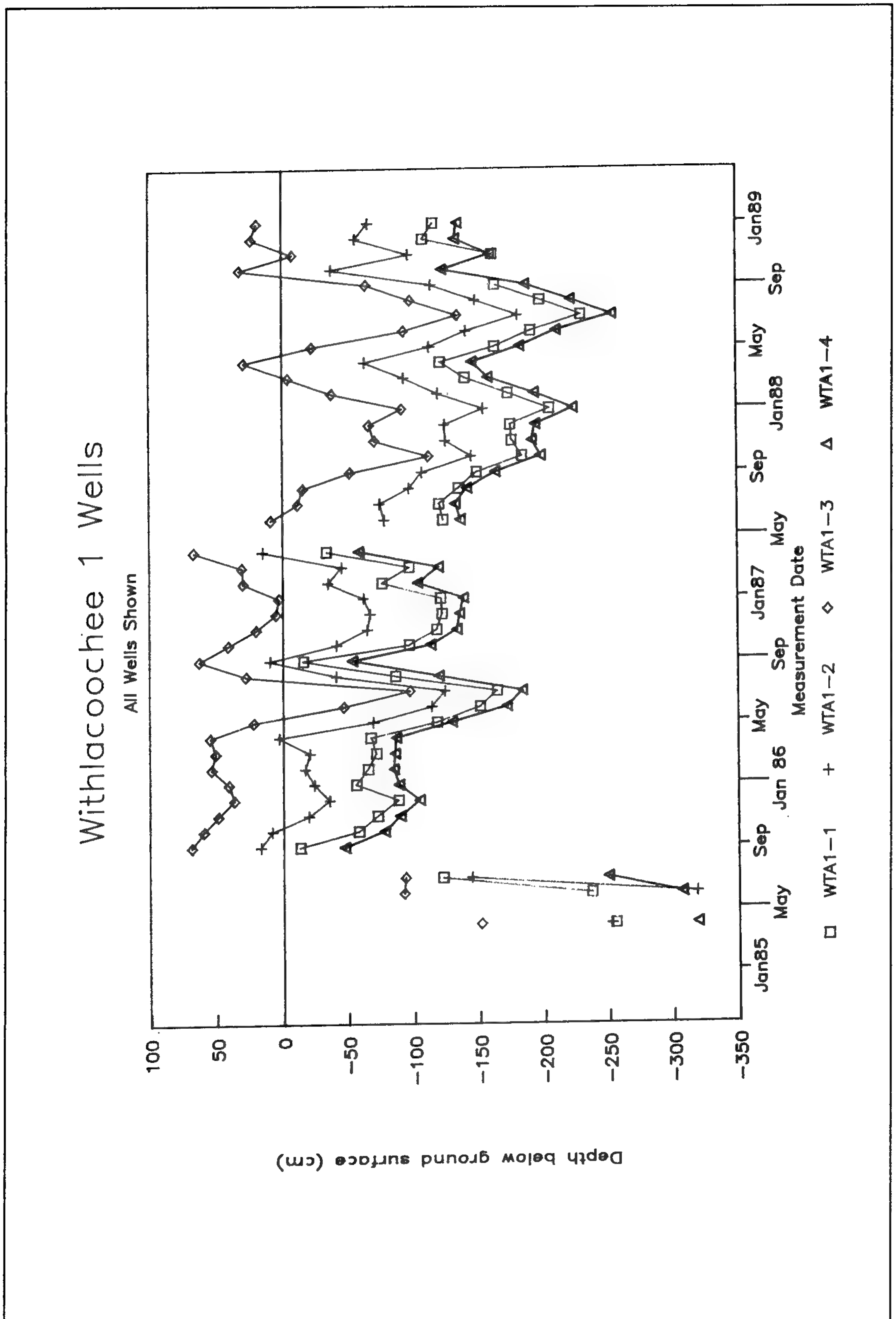

Smith Tract 1 Wells
All Wells Shown
Depth below ground surface (cm)
20
10
0
−10
−20
−30
−40
−50
−60
−70
−80
−90
−100
−110
−120
Jan 85
May
Sep
Jan 86
May
Sep
Jan 87
May
Sep
Jan 88
May
Sep
Jan 89
May
Measurement Date
SMT−1
SMT−2
SMT−3
SMT−4

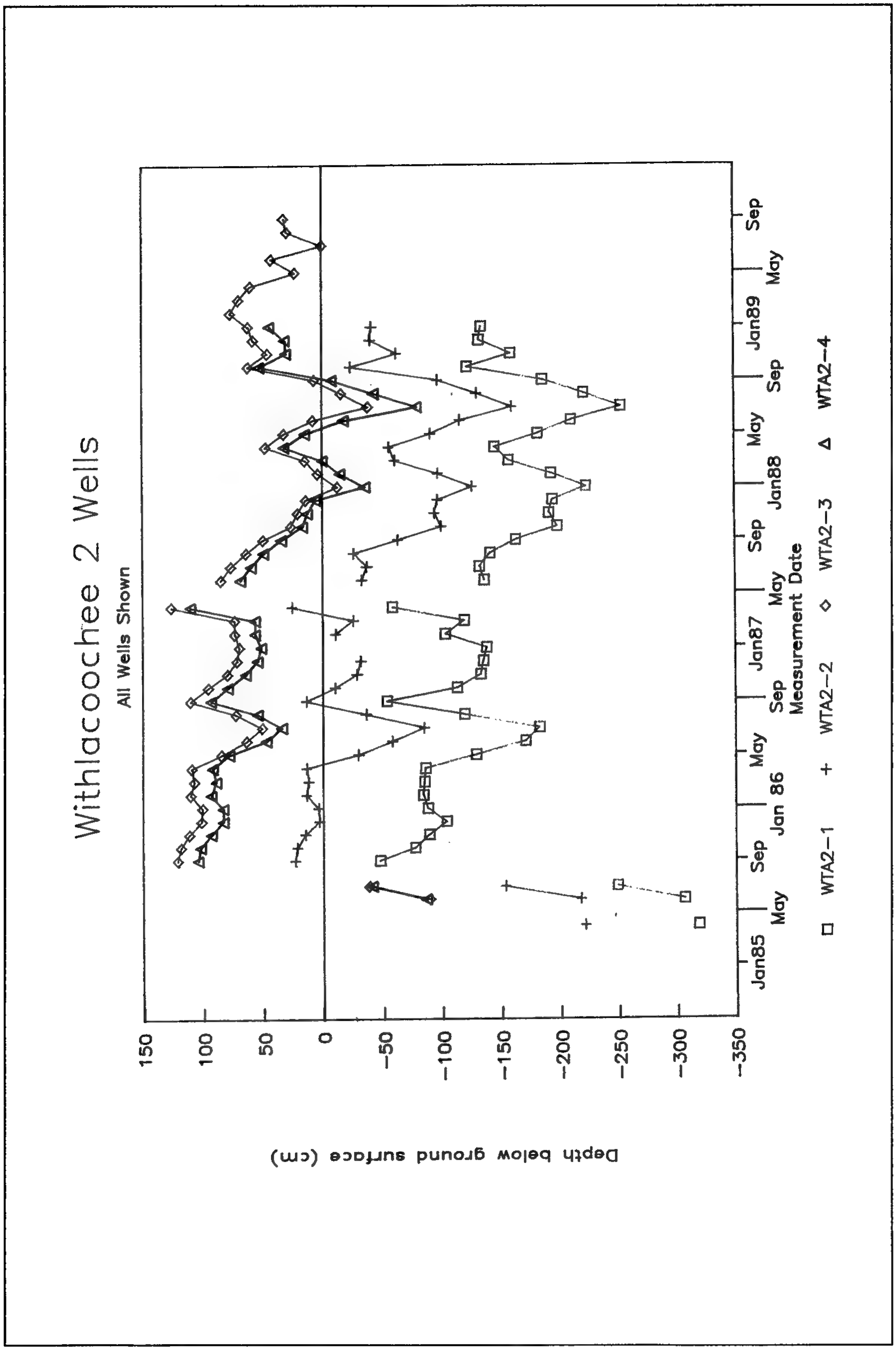

Tiger Creek Headwaters Wells
All Wells and Stage
Depth below ground surface (cm)
Measurement Date
Jan 85 May Sep Jan 86 May Sep Jan 87 May Sep Jan 88 May Sep Jan 89 May Sep Jan 90 May Sep Jan 91
30 20 10 0 −10 −20 −30 −40 −50 −60 −70 −80 −90 −100 −110 −120 −130 −140 −150
□ THW−1 + THW−2 ◇ THW−3 Δ THW−4 × THW−Stage


Tiger Creek Red Gum Trail Wells
Wells 1–4
Depth below ground surface (cm)
10
0
−10
−20
−30
−40
−50
−60
−70
−80
−90
−100
−110
−120
−130
−140
Jan 85
May
Sep
Jan 86
May
Sep
Jan 87
May
Sep
Jan 88
May
Sep
Jan 89
May
Sep
Jan 90
May
Sep
Jan 91
Measurement Date
TRG−1
TRG−2
TRG−3
TRG−4

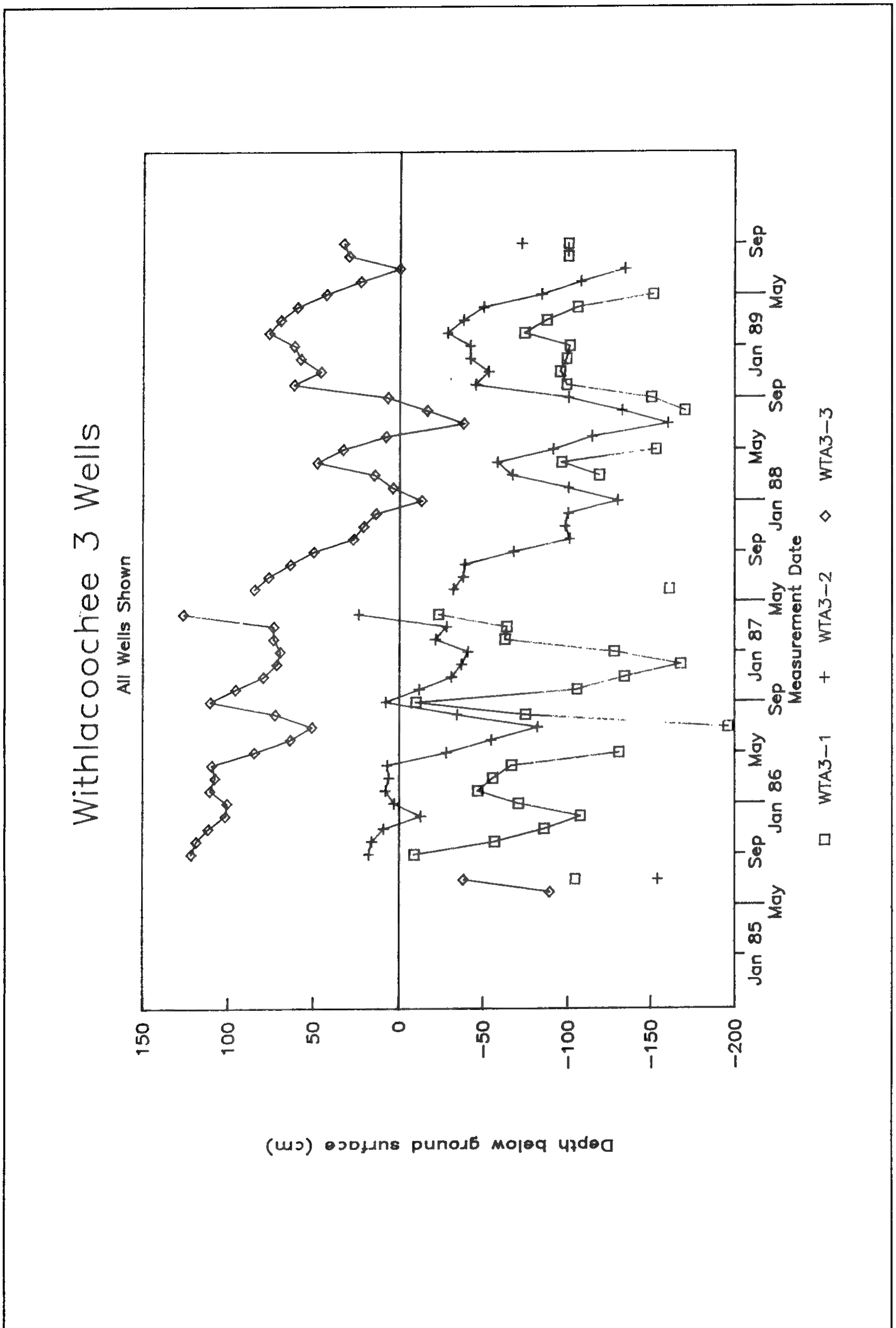

Tiger Creek Red Gum Trail Wells
Wells 5–7 and Staff Gage
Depth below ground surface (cm)
20
0
−20
−40
−60
−80
−100
−120
−140
−160
−180
−200
Jan 86
May
Sep
Jan 87
May
Sep
Jan 88
May
Sep
Jan 89
May
Sep
Jan 90
May
Sep
Jan 91
Measurement Date
□ TRG–5
+ TRG–6
◇ TRG–7
Δ TRG–Stage

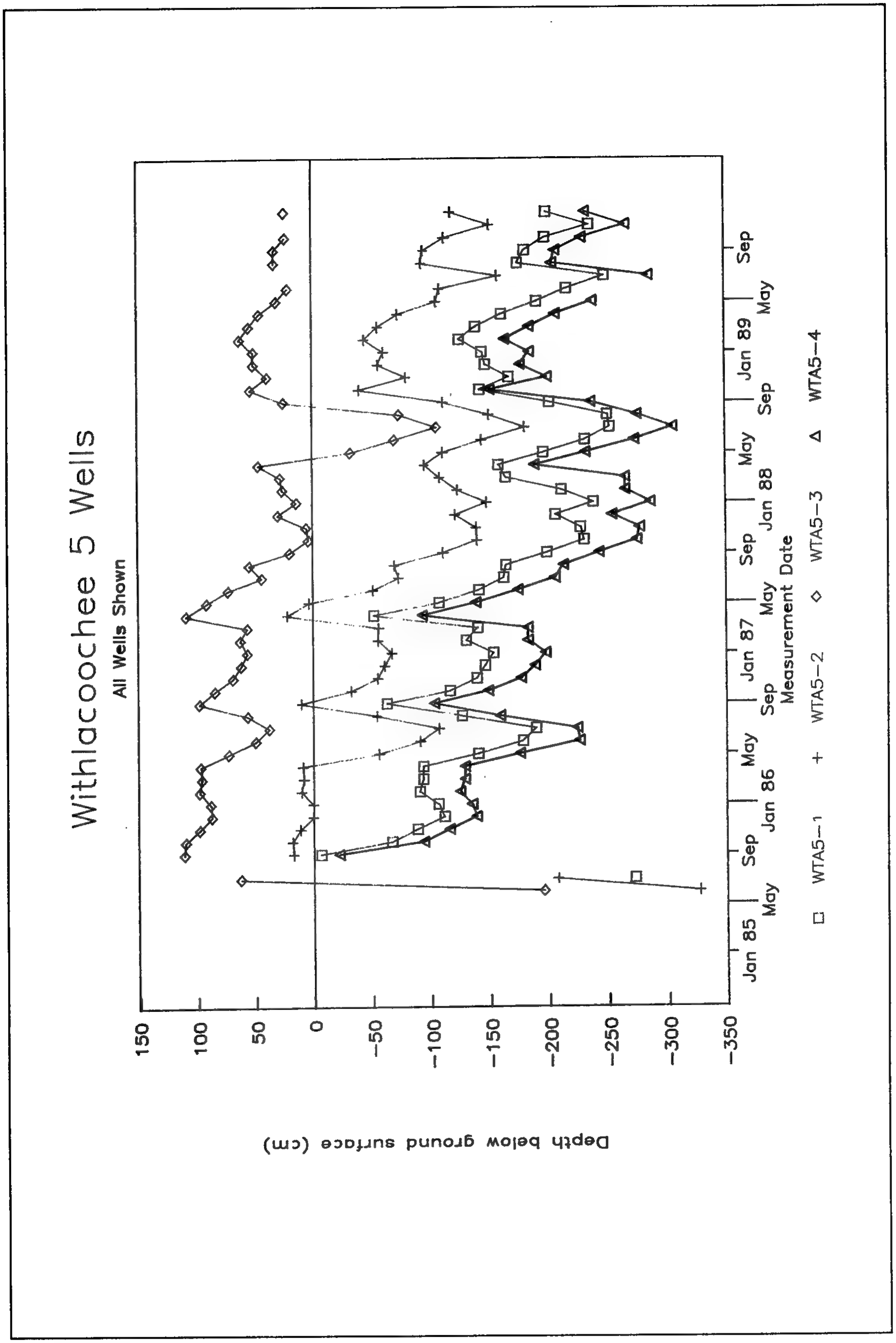

Windsor 2 Wells
All Wells Shown
Depth below ground surface (cm)
100
50
0
−50
−100
−150
−200
−250
−300
Jan 87
May
Sep
Jan 88
May
Sep
Jan 89
May
Sep
Measurement Date
WSR−1a
WSR−1b
WSR−2
WSR−3
WSR−4


Withlacoochee 1 Wells
All Wells Shown
Depth below ground surface (cm)
100
50
0
−50
−100
−150
−200
−250
−300
−350
Jan85
May
Sep
Jan 86
May
Sep
Jan87
May
Sep
Jan88
May
Sep
Jan89
Measurement Date
WTA1−1
WTA1−2
WTA1−3
WTA1−4



Withlacoochee 2 Wells
All Wells Shown
Depth below ground surface (cm)
150
100
50
0
−50
−100
−150
−200
−250
−300
−350
Jan85
May
Sep
Jan 86
May
Sep
Jan87
May
Sep
Jan88
May
Sep
Jan89
May
Sep
Measurement Date
□ WTA2−1
+ WTA2−2
◇ WTA2−3
Δ WTA2−4


Withlacoochee 3 Wells
All Wells Shown
Depth below ground surface (cm)
150
100
50
0
−50
−100
−150
−200
Jan 85
May
Sep
Jan 86
May
Sep
Jan 87
May
Sep
Jan 88
May
Sep
Jan 89
May
Sep
Measurement Date
□ WTA3−1
+ WTA3−2
◇ WTA3−3


Withlacoochee 5 Wells
All Wells Shown
Depth below ground surface (cm)
150
100
50
0
-50
-100
-150
-200
-250
-300
-350
Jan 85
May
Sep
Jan 86
May
Sep
Jan 87
May
Sep
Jan 88
May
Sep
Jan 89
May
Sep
Measurement Date
□ WTA5-1 + WTA5-2 ◇ WTA5-3 △ WTA5-4

Appendix B
Soil Profile Descriptions

HHP1- Highlands Hammock\Highlands County

Transect 1, Pedon 1, Smyrna fine sand (1).

Sandy, siliceous, hyperthermic Aeric Haplaquods

01- 3 to 2 inches; loose leaf litter.

02- 2 to 0 inches; root/leaf mat.

A1- 0 to 5 inches; black (10YR 2/1) fine sand; artificial fill material; 50% of soil particles are covered or coated with organic matter; moderate medium granular structure; very friable; many fine roots; clear wavy boundary.

A2- 5 to 8 inches; black (10YR 2/1) fine sand; artificial fill material; 75% of soil particles are covered or coated with organic matter; common medium faint very dark gray (10YR 3/1) spots; moderate medium granular structure; very friable; common fine roots; clear wavy boundary.

A1b- 8 to 12 inches; black (10YR 2/1) fine sand; 90% of soil particles are covered or coated with organic matter; strong medium granular structure; very friable; common fine roots; clear wavy boundary.

Eb- 12 to 21 inches; dark gray (10YR 4/1) fine sand; single grained; loose; few fine roots; abrupt wavy boundary.

Bh1b- 21 to 31 inches; black (5YR 2/1) fine sand; massive; friable; few fine roots; sand grains well coated with organic matter; gradual wavy boundary.

Bh2b- 31 to 47 inches; dark reddish brown (5YR 3/2) fine sand; massive; very friable; few fine roots; sand grains well coated with organic matter; gradual wavy boundary.

Bh3b- 47 to 55 inches; dark reddish brown (5YR 3/3) fine sand; massive; very friable; few fine roots; sand grains well coated with organic matter; abrupt wavy boundary.

Bh4b- 55 to 60 inches; black (5YR 2/1) fine sand; massive; very firm; weakly cemented; sand grains well coated with organic matter.

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(1) Because the top 8 inches of this pedon were artificial fill, this site does not meet the hydric soil criteria. However, soils surrounding this filled area are hydric due to the presence of soil particles that are covered or coated with organic matter.

HHP1- Highlands Hammock\Highlands County

Transect 1, Pedon 2, Samsula muck, depressional.

Sandy or sandy-skeletal, siliceous, dysic, hyperthermic Terric Medisaprists

01- 3 to 0 inches; loose leaf litter.

Oa1- 0 to 3 inches; dark reddish brown (5YR 3/2) muck; less than 10% rubbed fiber; massive; friable; many fine roots; abrupt smooth boundary.

Oa2- 3 to 22 inches; black (5YR 2.5/1) muck; less than 5% rubbed fiber; massive; very friable; few fine roots; gradual wavy boundary.

C1- 22 to 25 inches; black (5YR 2.5/1) fine sand; massive; very friable; few fine roots; gradual wavy boundary.

C2- 25 to 38 inches; very dark gray (10YR 3/1) fine sand; massive; very friable; few fine roots; gradual wavy boundary.

C3- 38 to 52 inches; dark reddish brown (5YR 2.5/2) fine sand; massive; very friable; sand grains well coated with organic matter.

HHP1- Highlands Hammock\Highlands County

Transect 1, Pedon 3, Samsula muck, depressional.

Sandy or sandy-skeletal, siliceous, dysic, hyperthermic Terric Medisaprists

01- 1 to 0 inches; loose leaf litter.

Oa1- 0 to 3 inches; dark reddish brown (5YR 3/2) muck; 10% rubbed fiber; massive; very friable; many fine roots; abrupt smooth boundary.

Oa2- 3 to 30 inches; black (5YR 2.5/1) muck; 5% rubbed fiber; massive; very friable; common fine roots; sulfur smell; clear wavy boundary.

C1- 30 to 36 inches; very dark grayish brown (5YR 3/2) fine sand; massive; single grained; clear wavy boundary.

C2- 36 to 52 inches; dark reddish brown (5YR 3/2) fine sand; massive; very friable.

HHP1- Highlands Hammock\Highlands County

Transect 1, Pedon 4, Samsula muck, depressional.

Sandy or sandy-skeletal, siliceous, dysic, hyperthermic Terric Medisaprists

01- 6 to 3 inches; loose leaf litter.

02- 3 to 0 inches; root/leaf mat.

Oa1- 0 to 4 inches; dark reddish brown (5YR 3/2) muck; 10% rubbed fiber; massive; friable; many fine roots; sulfur smell; abrupt smooth boundary.

Oa2- 4 to 18 inches; black (5YR 2.5/1) muck; 5% rubbed fiber; massive; very friable; few fine roots; sulfur smell; abrupt smooth boundary.

C1- 18 to 22 inches; black (10YR 2/1) fine sand; 90% of soil particles are covered or coated with organic matter; massive; very friable; few fine roots; gradual wavy boundary.

C2- 22 to 26 inches; very dark gray (10YR 3/1) fine sand; single grained; loose; few fine roots; gradual wavy boundary.

C3- 26 to 40 inches; dark gray (10YR 4/1) fine sand; single grained; loose; few fine roots; gradual wavy boundary.

C4- 40 to 52 inches; dark brown (7.5YR 3/2) fine sand; massive; very friable; sand grains weakly coated with organic matter.

HHP1- Highlands Hammock\Highlands County

Transect 1, Pedon 5, Placid fine sand.

Sandy, siliceous, hyperthermic Typic Humaquepts

01- 3 to 2 inches; loose leaf litter.

02- 2 to 0 inches; root/leaf mat.

A1- 0 to 5 inches; black (5YR 2.5/1) fine sand; 90% of soil particles are covered or coated with organic matter; moderate fine granular structure; very friable; many fine roots; clear wavy boundary.

A2- 5 to 10 inches; black (10YR 2/1) fine sand; 80% of soil particles are covered or coated with organic matter; moderate medium granular structure; very friable; common fine and few medium roots; gradual wavy boundary.

Cg1- 10 to 27 inches; dark gray (10YR 4/1) fine sand; common fine faint very dark gray (10YR 3/1) vertical streaks; weak coarse granular structure; very friable; few fine roots; gradual wavy boundary.

Cg2- 27 to 35 inches; gray (10YR 6/1) fine sand; many medium distinct very dark gray (10YR 3/1) streaks; single grained; loose; few fine roots; gradual wavy boundary.

Cg3- 35 to 50 inches; light gray (10YR 7/1) fine sand; single grained; loose; gradual wavy boundary.

Cg4- 50 to 60 inches; light brownish gray (10YR 6/2) fine sand; single grained; loose.

Note: probably a spodic horizon below 60 inches.

HHP2- Highlands Hammock\Highlands County

Transect 2, Pedon 1, Punta fine sand.

Sandy, siliceous, hyperthermic Grossarenic Haplaquods

01- 1 to 0 inches; loose leaf litter;

A1- 0 to 6 inches; very dark gray (10YR 3/1) fine sand; 10% of soil particles are covered or coated with organic matter; many fine faint black (10YR 2/1) organic granules (2 to 5 mm in diameter) that have sand grains within; few fine faint black (10YR 2/1) organic accretions with some sand grains within; single grained; loose; few fine roots; gradual wavy boundary;

A2- 6 to 27 inches; dark gray (10YR 4/1) fine sand; common coarse faint gray (10YR 5/1) mottles in a splotchy pattern; single grained; loose; few fine roots; gradual wavy boundary.

E- 27 to 52 inches; light gray (10YR 7/1) fine sand; single grained; loose; gradual wavy boundary.

EB- 52 to 57 inches; dark gray (10YR 4/1) fine sand; single grained; loose; clear wavy boundary.

Bh-57 to 60 inches; very dark gray (10YR 3/1) fine sand; massive; very friable; sand grains coated with organic matter.

HHP2- Highlands Hammock\Highlands County

Transect 2, Pedon 2, Basinger muck, depressional.

Siliceous, hyperthermic Spodic Psammaquents

02- 5 to 0 inches; root/leaf mat.

Oa- 0 to 4 inches; black (5YR 2.5/1) muck; less than 5% rubbed fiber; massive; very friable; many fine roots; clear wavy boundary.

A1- 4 to 6 inches; black (10YR 2/1) mucky fine sand; 95% of soil particles are covered or coated with organic matter; common fine organic accretions; massive; very friable; common fine roots; clear wavy boundary.

A2- 6 to 8 inches; very dark gray (10YR 3/1) fine sand; single grained; loose; few fine roots; abrupt wavy boundary.

E- 8 to 30 inches; gray (10YR 5/1) fine sand; single grained; loose; few fine roots; gradual wavy boundary.

Bw- 30 to 60 inches; brown/dark brown (7.5YR 4/2) fine sand; sand grains thinly coated with organic matter; single grained; loose.

HHP2- Highlands Hammock\Highlands County

Transect 2, Pedon 3, Hontoon muck, depressional.

Sandy or sandy-skeletal, siliceous, dysic, hyperthermic Terric Medisaprists

02- 3 to 0 inches; root/leaf mat.

Oa1- 0 to 28 inches; dark reddish brown (5YR 3/2) muck; less than 5% rubbed fiber; massive; friable; few fine roots; sulfur smell; gradual wavy boundary.

Oa2- 28 to 52 inches; black (10YR 2/1) muck; less than 5% rubbed fiber; massive; friable.

HHP2- Highlands Hammock\Highlands County

Transect 2, Pedon 4, Samsula muck, depressional.

Sandy, siliceous, hyperthermic Grossarenic Haplaquods

Oa1- 0 to 5 inches; dark reddish brown (5YR 3/2) muck; less than 10% rubbed fiber; massive; friable; many fine roots; clear wavy boundary.

Oa2- 5 to 20 inches; black (10YR 2/1) muck; less than 5% rubbed fiber; massive; very friable; sulfur smell; gradual wavy boundary.

C- 20 to 26 inches; black (10YR 2/1) mucky fine sand; 90% of soil particles are covered or coated with organic matter; massive; very friable; gradual wavy boundary.

Cg- 26 to 52 inches; dark reddish brown (5YR 3/2) fine sand; massive; very friable; sand grains well coated with organic matter;

HHP2- Highlands Hammock\Highlands County

Transect 2, Pedon 5, Punta fine sand.

Coarse-loamy, siliceous, hyperthermic Mollic Ochraqualfs

01- 3 to 2 inches; loose leaf litter.

02- 2 to 0 inches; root/leaf mat.

A1- 0 to 5 inches; black (10YR 2/1) fine sand; 60% of soil particles are covered or coated with organic matter; moderate medium granular structure; very friable; few fine roots; gradual wavy boundary.

A2- 5 to 9 inches; very dark gray (10YR 3/1) fine sand; 40% of soil particles are covered or coated with organic matter; weak coarse granular structure; very friable; few fine roots; gradual wavy boundary.

E1- 9 to 30 inches; dark gray (10YR 4/1) fine sand; common fine faint very dark gray (10YR 3/1) streaks; few fine distinct black (10YR 2/1) streaks along root channels; single grained; loose; few fine roots; gradual wavy boundary.

E2- 30 to 42 inches; dark gray (10YR 4/1) fine sand; common medium faint gray (10YR 5/1) mottles in a splotchy pattern; single grained; loose; few fine roots; gradual wavy boundary.

E3- 42 to 55 inches; light gray (10YR 7/1) fine sand; common medium distinct grayish brown (10YR 5/2) mottles in a splotchy pattern; single grained; loose; gradual wavy boundary.

Bh- 55 to 60 inches; very dark grayish brown (10YR 3/2) fine sand; 85% of sand grains thinly coated with organic matter; massive; very friable.

HHP4- Highlands Hammock\Highlands County

Transect 4, Pedon 1, Parkwood fine sand.

Coarse-loamy, siliceous, hyperthermic Mollic Ochraqualfs

01- 3 to 0 inches; loose leaf litter.

A- 0 to 4 inches; very dark gray (10YR 3/1) fine sand; 25% of soil particles are covered or coated with organic matter; many medium distinct black (10YR 2/1) organic granules; common fine distinct light brownish gray (10YR 6/2) sand in between granules; strong medium granular structure; friable; common fine and medium, few coarse roots; clear wavy boundary.

Btg- 4 to 14 inches; dark brown (7.5YR 3/2) fine sandy loam; weak, very coarse subangular blocky structure; friable; common fine and medium and few coarse roots; sand grains bridged and coated with clay; clear wavy boundary.

Btgk- 14 to 55 inches; light brownish gray (10YR 6/2) fine sandy loam; many fine faint light brownish gray (10YR 6/2) secondary calcium carbonate nodules; weak, very coarse subangular blocky structure; firm; few fine roots; sand grains bridged and coated with clay; clear wavy boundary.

Cg- 55 to 60 inches; brown (10YR 5/3) fine sandy loam; massive; very friable.

HHP4- Highlands Hammock\Highlands County

Transect 4, Pedon 2, Parkwood loamy fine sand.

Coarse-loamy, siliceous, hyperthermic Mollic Ochraqualfs

01- 1 to 0 inches; loose leaf litter.

A- 0 to 1 inches; dark gray (10YR 4/1) loamy fine sand; 50% of soil particles are covered or coated with organic matter; many medium distinct black (10YR 2/1) loamy granules; strong medium granular structure; very friable; common fine and few medium roots; abrupt smooth boundary.

Bt- 1 to 6 inches; black (10YR 2/1) fine sandy loam; 70% of soil particles are covered or coated with organic matter; strong medium granular structure; friable; many fine, few medium and coarse roots; sand grains bridged and coated with clay; clear wavy boundary.

Btgk1- 6 to 9 inches; dark gray (10YR 4/1) fine sandy loam; many fine prominent white (10YR 8/1) secondary calcium carbonate nodules; weak, very coarse subangular blocky structure; friable; common fine and medium roots; sand grains bridged and coated with clay; clear wavy boundary.

Btgk2- 9 to 50 inches; gray (10YR 5/1) fine sandy loam; many fine distinct white (10YR 8/1) secondary calcium carbonate nodules; common fine distinct very dark grayish brown (10YR 3/2) streaks along old root channels; weak, very coarse subangular blocky structure; firm; few fine roots; sand grains bridged and coated with clay; gradual wavy boundary.

Btg3- 50 to 60 inches; greenish gray (5BG 5/1) sandy clay loam; many coarse prominent light olive brown (2.5Y 5/6) mottles; many coarse prominent dark brown (7.5YR 4/4) bodies; weak, very coarse subangular blocky structure; very friable; sand grains bridged and coated with clay.

HHP4- Highlands Hammock\Highlands County

Transect 4, Pedon 3, Chobee muck, depressional.

Fine-loamy, siliceous, hyperthermic Typic Argiaquolls

01- 2 to 0 inches; loose leaf litter.

Oa- 0 to 2 inches; black (10YR 2/1) muck; 10% rubbed fiber; moderate fine granular structure; friable; many fine and common medium roots; abrupt smooth boundary.

A- 2 to 6 inches; very dark gray (10YR 3/1) sandy clay loam; massive; friable; few fine roots; clear wavy boundary.

Btg1- 6 to 15 inches; very dark gray (10YR 3/1) sandy clay loam; massive; firm; few fine roots; sand grains bridged and coated with clay; gradual wavy boundary.

Btg2- 15 to 28 inches; very dark gray (10YR 3/1) sandy clay; common medium distinct dark yellowish brown (10YR 3/4) mottles; massive; firm; few fine roots; sand grains bridged and coated with clay; gradual wavy boundary.

Btgk1- 28 to 42 inches; dark gray (10YR 4/1) sandy clay loam; many fine prominent white (10YR 8/1) secondary calcium carbonate nodules; few medium distinct brown/dark brown (10YR 4/3) mottles; weak, very coarse subangular blocky structure; firm; sand grains bridged and coated with clay; gradual wavy boundary.

Btgk2- 42 to 60 inches; light brownish gray (10YR 6/2) sandy clay loam; common medium prominent yellowish brown (10YR 5/6) mottles; many fine distinct white (10YR 8/1) secondary calcium carbonate nodules; few fine distinct black (10YR 2/1) streaks; weak, very coarse subangular blocky structure; firm; sand grains bridged and coated with clay.

MMB2- Mormon Branch/Marion County

Transect 1, Pedon 1, Smyrna fine sand.

Sandy, siliceous, hyperthermic Aeric Haplaquods

01- 6 to 4 inches; loose leaf litter.

02- 4 to 0 inches; intermediately decomposed leaf/root mat.

A- 0 to 4 inches; black (10YR 2/1) fine sand; 50% of soil particles are covered or coated with organic matter; weak fine granular structure; very friable; many fine and medium, and common coarse roots; clear smooth boundary.

E- 4 to 17 inches; pinkish gray (7.5YR 6/2) fine sand; common coarse distinct light brownish gray (10YR 6/2) mottles in a splotchy pattern; single grained; loose; common fine and medium, few coarse roots; gradual wavy boundary.

Bw- 17 to 27 inches; brown/dark brown (7.5YR 4/2) fine sand; few medium faint pinkish gray (7.5YR 6/2) mottles in a splotchy pattern; massive; very friable; few fine and coarse roots; sand grains thinly coated with organic matter; clear wavy boundary.

Bh1- 27 to 35 inches; dark reddish brown (5YR 3/2) fine sand; massive; friable; few fine roots; sand grains well coated with organic matter; gradual wavy boundary.

Bh2- 35 to 43 inches; dark brown (7.5YR 3/4) fine sand; massive; very friable; few fine roots; sand grains coated with organic matter; gradual wavy boundary.

Bw'1- 43 to 50 inches; dark yellowish brown (10YR 4/4) fine sand; massive; very friable; gradual wavy boundary.

Bw'2- 50 to 60 inches; light olive brown ((2.5Y 5/4) fine sand; massive; very friable.

MMB2- Mormon Branch/Marion County

Transect 1, Pedon 2, Samsula muck, frequently flooded.

Sandy or sandy-skeletal, siliceous, dysic, hyperthermic Terric Medisaprists

01- 3 to 0 inches; loose leaf litter.

Oa1- 0 to 6 inches; black (5YR 2.5/1) muck; massive; very friable; many fine, medium and coarse roots; 10% rubbed fibers; clear wavy boundary.

Oa2- 6 to 30 inches; black (10YR 2/1) muck; massive; very friable; few fine roots; 5% rubbed fibers; gradual wavy boundary.

C1- 30 to 34 inches; black (10YR 2/1) mucky fine sand; massive very friable; clear wavy boundary.

C2- 34 to 52 inches; black (10YR 2/1) fine sand; massive; very friable.

MMB2- Mormon Branch/Marion County

Transect 1, Pedon 3, Samsula muck, frequently flooded.

Sandy or sandy-skeletal, siliceous, dysic, hyperthermic Terric Medisaprists

01- 2 to 0 inches; loose leaf litter.

Oa1- 0 to 20 inches; black (5YR 2.5/1) muck; massive; very friable; many fine, medium and coarse roots; gradual wavy boundary.

Oa2- 20 to 48 inches; black (5YR 2.5/1) muck; massive; very friable; few fine roots; gradual wavy boundary.

C- 48 to 52 inches; black (10YR 2/1) fine sand; 90% of soil particles are covered or coated with organic matter; massive; very friable.

MMB2- Mormon Branch/Marion County

Transect 1, Pedon 4, Daytona fine sand.

Sandy, siliceous, hyperthermic Entic Haplohumods

01- 1 to 0 inches; loose leaf litter.

A- 0 to 3 inches; gray (10YR 6/1) fine sand; weak fine granular structure; very friable; many fine roots; abrupt smooth boundary.

E1- 3 to 19 inches; white (10YR 8/1) fine sand; few medium faint gray (10YR 6/1) streaks along root channels; single grained; loose; common fine and few coarse roots; gradual wavy boundary.

E2- 19 to 26 inches; light brownish gray (10YR 6/2) fine sand; many medium faint light gray (10YR 7/2) mottles in a splotchy pattern; single grained; loose; few fine roots; gradual wavy boundary.

E3- 26 to 31 inches; grayish brown (10YR 5/2) fine sand; common medium distinct light gray (10YR 7/2) mottles in a splotchy pattern; single grained; loose; few fine roots; clear wavy boundary.

Bh1- 31 to 34 inches; dark brown (7.5YR 3/2) fine sand; single grained; loose; few fine roots; sand grains very thinly coated with organic matter; clear wavy boundary.

Bh2- 34 to 45 inches; dark reddish brown (5YR 3/2) fine sand; massive; very friable; few fine roots; sand grains well coated with organic matter; gradual wavy boundary.

BC- 45 to 53 inches; brown (10YR 5/3) fine sand; common medium faint brown (7.5YR 4/2) mottles in a splotchy pattern; single grained; loose; few roots; gradual wavy boundary.

C- 53 to 60 inches; grayish brown (2.5Y 5/2) fine sand; single grained; loose.

OSC1- Osceola National Forest/Baker County

Pedon 1, Sapelo mucky peat, depressional.

Sandy, siliceous, thermic Ultic Haplaquods

01- 1 to 0 inches; loose leaf litter.

Oe- 0 to 2 inches; dark reddish brown (5YR 3/2) mucky peat; 30% rubbed fiber; weak coarse granular structure; friable; many fine roots; abrupt smooth boundary.

A- 2 to 4 inches; black (5YR 2.5/1) fine sand; 70% of soil particles are covered or coated with organic matter; strong coarse granular structure; very friable; many fine, medium and coarse roots; abrupt smooth boundary.

E- 4 to 23 inches; gray (10YR 5/1) fine sand; weak medium granular structure; loose; few fine roots; abrupt smooth boundary.

Bh1- 23 to 33 inches; black (5YR 2.5/1) fine sand; massive; friable; few fine roots; sand grains coated with organic matter; clear wavy boundary.

Bh2- 33 to 36 inches; dark reddish brown (5YR 3/2) fine sand; massive; friable; few fine roots; sand grains coated with organic matter; clear wavy boundary.

Bh3- 36 to 42 inches; reddish brown (5YR 4/4) fine sand; massive; very friable; sand grains coated with organic matter; abrupt wavy boundary.

Btg- 42 to 60 inches; dark grayish brown (10YR 4/2) sandy loam; sand grains bridged and covered with clay; weak, very coarse subangular blocky structure; firm; few fine roots.

OSC1- Osceola National Forest/Baker County

Pedon 2, Plummer mucky peat, depressional (1).

Loamy, siliceous, thermic Grossarenic Paleaquults

Oe- 0 to 6 inches; dark reddish brown (5YR 3/2) mucky peat; 25% rubbed fiber; weak coarse granular structure; friable; many fine and coarse roots; gradual wavy boundary.

Oa- 6 to 12 inches; black (5YR 2.5/1) muck; 10% rubbed fiber; massive; very friable; many fine roots; clear wavy boundary.

A1- 12 to 16 inches; black (10YR 2/1) mucky fine sand; massive; very friable; few fine roots; gradual wavy boundary.

A2- 16 to 30 inches; black (10YR 2/1) fine sand; massive; very friable; few fine roots; gradual wavy boundary.

Eg1- 30 to 40 inches; grayish brown (10YR 5/2) fine sand; many coarse distinct very dark grayish brown (10YR 3/2) spots; loose; single grained; fine sand; gradual wavy boundary.

Eg2- 40 to 50 inches; light brownish gray (10YR 6/2) fine sand; loose; single grained; few fine roots; gradual wavy boundary.

Btg- 50 to 60 inches; grayish brown (10YR 5/2) fine sandy loam; weak, very coarse subangular blocky structure; friable; few fine roots; sand grains bridged and coated with clay.

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(1) Taxadjunct to series -- the presence of a histic epipedon is outside the range for the Plummer series; however, this does not significantly affect the use or behavior of the soil.

OSC1- Osceola National Forest/Baker County

Pedon 3, Sapelo muck, depressional.

Sandy, siliceous, thermic, Ultic Haplaquods

Oa- 0 to 6 inches; black (5YR 2.5/1) muck; massive; friable; many fine roots; clear wavy boundary.

A1- 6 to 10 inches; black (10YR 2/1) mucky fine sand; massive; very friable; many fine roots; clear wavy boundary.

A2- 10 to 12 inches; black (10YR 2/1) fine sand; massive; very friable; many fine roots; clear wavy boundary.

E- 12 to 25 inches; gray (10YR 5/1) fine sand; single grained; loose; few fine roots; clear wavy boundary.

Bh1- 25 to 30 inches; dark reddish brown (5YR 3/2); fine sand; massive; very friable; clear wavy boundary.

Bh2- 30 to 50 inches; brown (7.5YR 4/2) fine sand; sand grains coated with organic matter; massive; very friable; abrupt wavy boundary.

Btg- 50 to 60 inches; reddish gray (5YR 5/2) fine sandy loam; weak, very coarse subangular blocky structure; friable; sand grains bridged and coated with clay.

OSC1- Osceola National Forest/Baker County

Pedon 4, Mascotte fine sand.

Sandy, siliceous, thermic, Ultic Haplaquods

01- 3 to 2 inches; loose leaf litter.

02- 2 to 0 inches; root/leaf mat.

A1- 0 to 2 inches; black (10YR 2/1) fine sand; 80% of soil particles are covered or coated with organic matter; strong coarse granular structure; friable; many fine, medium and coarse roots; abrupt smooth boundary.

A2- 2 to 4 inches; black (10YR 2/1) fine sand; 70% of soil particles are covered or coated with organic matter; moderate coarse granular structure; very friable; many fine roots; abrupt wavy boundary.

E1- 4 to 6 inches; dark gray (10YR 4/1) fine sand; single grained; loose; few fine roots; clear wavy boundary.

E2- 6 to 23 inches; grayish brown (10YR 5/2) fine sand; few medium distinct very dark gray (10YR 3/1) lines along root channels; single grained; loose; few fine roots; clear wavy boundary.

E/Bh- 23 to 33 inches; grayish brown (10YR 5/2) fine sand; many coarse distinct black (5YR 2.5/1) Bh bodies; massive; friable; few fine roots; clear wavy boundary.

Bh1- 33 to 37 inches; dark brown (7.5YR 3/2) fine sand; sand grains coated with organic matter; massive; friable; few fine roots; clear wavy boundary.

Btg- 37 to 60 inches; weak red (2.5YR 5/2) fine sandy loam; many prominent fine strong brown (7.5YR 5/8) mottles along root channels and many coarse prominent brown (7.5YR 4/2) bodies; massive; friable.

PAL1- Lake Palestine

Transect 1, Pedon 1, Plummer fine sand.

Loamy, siliceous, thermic Grossarenic Paleaquults

01- 2.5 to 1.5 inches; loose leaf litter.

02- 1.5 to 0 inches; leaf/root mat.

A1- 0 to 3 inches; very dark gray (10YR 3/1) fine sand; 40% of soil particles are covered or coated with organic matter; weak medium granular structure; very friable; common fine and few medium roots; clear smooth boundary.

A2- 3 to 7 inches; very dark grayish brown (10YR 3/2) fine sand; many uncoated sand grains; weak medium granular structure; very friable; few fine roots; clear wavy boundary.

E1- 7 to 10 inches; dark gray (10YR 4/1) fine sand; weak medium granular structure; very friable; few fine faint gray (10YR 5/1) mottles in a splotchy pattern; few fine roots; clear wavy boundary.

E2- 10 to 14 inches; gray (10YR 5/1) fine sand; weak fine granular structure; very friable; few fine and medium roots; gradual wavy boundary.

E3- 14 to 20 inches; grayish brown (2.5Y 5/2) fine sand; weak fine granular structure; very friable; few fine roots; gradual wavy boundary.

E4- 20 to 27 inches; light brownish gray (10YR 6/2) fine sand; few fine faint light gray (10YR 6/1) mottles; few fine prominent strong brown (7.5YR 5/8) mottles along root channels; single grained; loose; gradual wavy boundary.

E5- 27 to 33 inches; very pale brown (10YR 7/3) fine sand; common fine prominent strong brown (7.5YR 5/8) mottles; single grained; loose; gradual wavy boundary.

E6- 33 to 38 inches; very pale brown (10YR 7/3) fine sand; common medium faint light brownish gray (10YR 6/2) mottles; many medium prominent yellowish brown (10YR 5/8) mottles; approximately 4% plinthite and 2% iron stone; single grained; loose; clear wavy boundary.

Btg1- 38 to 42 inches; light brownish gray (2.5Y 6/2) fine sandy loam; many medium prominent strong brown (7.5YR 5/8) and few fine prominent yellowish red (5YR 4/6) mottles; weak, very coarse subangular blocky structure; very firm; sand grains coated with clay, gradual wavy boundary.

Btg2- 42 to 60 inches; gray (10YR 6/1) sandy clay loam; common medium distinct brownish yellow (10YR 6/8) and few fine prominent strong brown (7.5YR 5/8) mottles; weak, very coarse subangular blocky structure; friable; sand grains coated with clay; gradual wavy boundary.

PAL1- Lake Palestine

Transect 1, Pedon 2, Sapelo muck, depressional (1).

Sandy, siliceous, thermic Ultic Haplaquods

01- 3 to 1 inches; loose leaf litter.

02- 1 to 0 inches; leaf/root mat.

Oa- 0 to 1 inches; black (10YR 2/1) muck; weak medium granular structure; very friable; many fine, medium and coarse roots; common organic accretions; abrupt smooth boundary.

A1- 1 to 5 inches; black (10YR 2/1) mucky fine sand; 80% of soil particles are covered or coated with organic matter; weak medium granular structure; very friable; few fine and medium roots; common organic accretions; clear wavy boundary.

A2- 5 to 8 inches; black (10YR 2/1) fine sand; 80% of soil particles are covered or coated with organic matter; few fine faint dark gray (10YR 4/1) mottles; weak fine granular structure; very friable; clear wavy boundary.

E1- 8 to 11 inches; grayish brown (10YR 5/2) fine sand, few fine faint brown (10YR 5/3) mottles occurring in a splotchy pattern; common medium distinct very dark grayish brown (10YR 3/2) streaks; weak fine granular structure; very friable; clear wavy boundary.

E2- 11 to 15 inches; very dark gray (10YR 3/1) fine sand; common medium prominent strong brown (7.5YR 5/8) and few fine distinct dark brown (10YR 3/2) tubular mottles along root channels; weak fine granular structure; very friable; gradual wavy boundary.

Bw/Bh- 15 to 21 inches; yellowish red (5YR 4/6) fine sand; common medium faint dark reddish brown (5YR 3/4) Bh bodies; single grained; loose; sand grains coated with organic matter; gradual wavy boundary.

Bw- 21 to 29 inches; light yellowish brown (10YR 6/4) fine sand; few fine prominent dark reddish brown (5YR 3/3) mottles; single grained; loose; gradual wavy boundary.

E'- 29 to 41 inches; light brownish gray (10YR 6/2) fine sand; few fine prominent dark reddish brown (5YR 3/3) mottles; single grained; loose; gradual wavy boundary.

Btg- 41 to 60 inches; light gray/gray (5Y 6/1) fine sandy loam; common fine prominent dark reddish brown (5YR 3/3) mottles; weak, very coarse subangular blocky structure; friable.

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(1) Taxadjunct series - this soil pedon lacks a spodic horizon and is outside the range defined for the Sapelo series, but this difference does not significantly affect the use and behavior of the soil.

PAL1- Lake Palestine

Transect 1, Pedon 3, Pamlico mucky peat, depressional.

Sandy or sandy-skeletal, siliceous, dysic, thermic Terric Medisaprists

01- 3 to 0 inches; loose leaf litter.

Oe- 0 to 2 inches; dark reddish brown (5YR 2.5/2) mucky peat; less than 40% rubbed fiber; friable; moderate medium granular; many fine and medium roots; clear smooth boundary;

Oa- 2 to 18 inches; dark reddish brown (5YR 2.5/2) muck; approximately 15% rubbed fiber; very friable; weak fine granular; many fine, medium, and common coarse roots; gradual wavy boundary.

C1- 18 to 20 inches; black (10YR 2/1) mucky fine sand; very friable; weak fine granular; few fine roots; abrupt wavy boundary.

C2- 20 to 22 inches; very dark gray (10YR 3/1) fine sand; very friable; weak fine granular, few fine roots; clear wavy boundary.

C3- 22 to 45 inches; dark brown (7.5YR 3/2) fine sand; few fine distinct grayish brown (10YR 5/2) mottles; single grained; loose; clear wavy boundary.

C4- 45 to 57 inches; yellowish brown (10YR 5/4) fine sand; single grained; loose; few fine and coarse roots; clear wavy boundary.

Cg5- 57 to 70 inches; grayish brown (10YR 5/2) fine sandy loam; massive; friable.

PMR- Patrick Creek Mid-reach/Polk County

Pedon 1, Samsula muck, frequently flooded.

Sandy or sandy-skeletal, siliceous, dysic, hyperthermic Terric Medisaprists

01- 7 to 5 inches; loose leaf litter.

02- 5 to 0 inches; root/leaf mat.

Oa1- 0 to 2 inches; black (10YR 2/1) muck; 5% rubbed fiber; strong medium granular; very friable; many fine roots; abrupt smooth boundary.

Oa2- 2 to 20 inches; black (10YR 2/1) muck; 5% rubbed fiber; massive; very friable; many fine and common medium roots; clear wavy boundary.

Oa3- 20 to 35 inches; dark reddish brown (5YR 3/2) muck; 10% rubbed fiber; massive; very friable; clear wavy boundary.

C1- 35 to 38 inches; black (10YR 2/1) fine sand; massive; very friable; clear wavy boundary.

C2- 38 to 60 inches; very dark gray (10YR 3/1) fine sand; massive; very friable.

PMR- Patrick Creek Mid-reach/Polk County

Pedon 2, Hontoon muck, frequently flooded.

Dysic, hyperthermic Typic Medisaprists

02- 2 to 0 inches; root/leaf mat.

Oa1- 0 to 2 inches; dark reddish brown (5YR 3/2) muck; less than 10% rubbed fiber; granular structure; very friable; many fine, medium and coarse roots; clear wavy boundary.

Oa2- 2 to 25 inches; black (10YR 2/1) muck; less than 5% rubbed fiber; massive; very friable; few fine roots; sulfur smell; gradual wavy boundary.

Oa3- 25 to 60 inches; dark reddish brown (5YR 3/2) muck; less than 10% rubbed fiber; massive; very friable;

PMR- Patrick Creek Mid-reach/Polk County

Pedon 3, Hontoon muck, frequently flooded (1).

Dysic, hyperthermic Typic Medisaprists

01- 10 to 8 inches; loose leaf litter.

02- 8 to 0 inches; root/leaf mat.

Oa1- 0 to 5 inches; black (10YR 2/1) muck; massive; very friable; few fine roots; clear smooth boundary.

Cg- 5 to 9 inches; light brownish gray (10YR 6/2) fine sand; common medium distinct black (10YR 2/1) organic stains; single grained; loose; few fine roots; sulfur smell; abrupt smooth boundary.

Oa2- 9 to 30 inches; black (10YR 2/1) muck; massive; very friable; less than 5% rubbed fibers; gradual wavy boundary.

Oa3- 30 to 60 inches; dark reddish brown (5YR 3/2) muck; massive; very friable; less than 10% rubbed fibers.

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(1) Taxadjunct to series - the presence of a 4-inch sandy mineral layer is outside the range defined for the Hontoon series; however, this does not significantly affect the use or behavior of the soil.

PMR- Patrick Creek Mid-reach/Polk County

Pedon 4, Hontoon muck, frequently flooded.

Dysic, hyperthermic Typic Medisaprists

01- 2 to 0 inches; loose leaf litter.

Oa1- 0 to 7 inches; black (10YR 2/1) muck; massive; very friable; common medium fine and coarse roots; less than 5% rubbed fibers; gradual wavy boundary.

Oa2- 7 to 25 inches; black (10YR 2/1) muck; massive; very friable; common fine roots; less than 5% rubbed fibers; sulfur smell; clear wavy boundary.

Oa3- 25 to 60 inches; dark reddish brown (5YR 3/2) muck; massive; very friable; less than 10% rubbed fibers.

PMR- Patrick Creek Mid-reach/Polk County

Pedon 5, Hontoon muck, frequently flooded.

Dysic, hyperthermic Typic Medisaprists

01- 2 to 0 inches; loose leaf litter.

Oa1- 0 to 7 inches; black (10YR 2/1) muck; massive; very friable; many fine, common medium and coarse roots; less than 5% rubbed fibers; gradual wavy boundary.

Oa2- 7 to 35 inches; black (10YR 2/1) muck; massive; very friable; common fine roots; less than 5% rubbed fibers; sulfur smell; clear wavy boundary.

Oa3- 35 to 60 inches; dark reddish brown (5YR 3/2) muck; massive; very friable; less than 10% rubbed fibers.

PMR- Patrick Creek Mid-reach/Polk County

Pedon 6, Hontoon muck, frequently flooded.

Dysic, hyperthermic Typic Medisaprists

01- 1 to 0 inches; loose leaf litter.

Oa1- 0 to 5 inches; black (10YR 2/1) muck; moderate coarse granular structure; very friable; many fine and medium roots; less than 5% rubbed fibers; clear wavy boundary.

Oa2- 5 to 10 inches; black (10YR 2/1) muck; weak coarse granular structure; very friable; few fine roots; less than 5% rubbed fibers; sulfur smell; abrupt wavy boundary.

Oa3- 10 to 52 inches; dark reddish brown (5YR 3/2) muck; massive; friable; few fine roots; less than 10% rubbed fibers.

PMR- Patrick Creek Mid-reach/Polk County

Pedon 7, Pomello fine sand.

Sandy, siliceous, hyperthermic Arenic Haplohumods

01- 2 to 0 inches; loose leaf litter.

A1- 0 to 2 inches; black (10YR 2/1) fine sand; slightly matted, many clean sand grains; organic particles 3 to 5 mm in diameter comprising approximately 30% of the matrix; weak fine granular structure; very friable; many fine roots; abrupt smooth boundary.

A2- 2 to 11 inches; very dark gray (10YR 3/1) fine sand; weak fine granular structure; very friable; many fine and common medium roots; many clean sand grains; clear wavy boundary.

A3- 11 to 19 inches; dark gray (10YR 4/1) fine sand; weak medium granular structure; very friable; common fine, few medium and few coarse roots; gradual wavy boundary.

E1- 19 to 26 inches; gray (10YR 5/1) fine sand; single grained; loose; common fine and few medium roots; gradual wavy boundary.

E2- 26 to 35 inches; light gray/gray (10YR 6/1) fine sand; single grained; loose; few fine roots; gradual wavy boundary.

E3- 35 to 49 inches; grayish brown (10YR 5/2) fine sand; common medium distinct light gray (10YR 7/1) splotches; single grained; loose; gradual wavy boundary.

Bh1- 49 to 55 inches; black (5YR 2.5/1) fine sand; common medium faint dark reddish brown (5YR 3/2) mottles; massive; friable; few fine roots; sand grains well coated with organic matter; clear wavy boundary.

Bh2- 55 to 60 inches; dark reddish brown (5YR 3/3) fine sand; massive; very friable; sand grains well coated with organic matter.

SMT1- Smith Tract/Orange County

Transect 1, Pedon 1, St. Johns muck (1).

Sandy, siliceous, hyperthermic Typic Haplaquods

01- 1 to 0 inches; loose leaf litter.

Oa- 0 to 1 inches; black (10YR 2/1) muck; moderate fine granular; very friable; many fine roots; abrupt smooth boundary;

A1- 1 to 2 inches; black (10YR 2/1) mucky fine sand; 90% of matrix is black; moderate fine granular structure; very friable; many fine roots; abrupt smooth boundary.

A2- 2 to 6 inches; black (10YR 2/1) fine sand; 70% of soil particles are covered or coated with organic matter; moderate fine granular structure; very friable; many fine roots; clear wavy boundary.

A3- 6 to 10 inches; very dark gray (10YR 3/1) fine sand; weak coarse granular structure; very friable; many fine, medium and coarse roots; many uncoated sand grains; clear wavy boundary.

E- 10 to 32 inches; gray (10YR 5/1) fine sand; common fine distinct black (10YR 2/1) streaks along old and new root channels; single grained; loose; few fine and medium roots; gradual smooth boundary.

BE- 32 to 35 inches; very dark grayish brown (7.5YR 3/2) fine sand; common medium faint dark grayish brown (10YR 4/2) mottles in splotchy pattern and few fine faint very dark gray (10YR 3/1) streaks along old root channels; massive; very friable; few fine roots; clear smooth boundary.

Bh1- 35 to 50 inches; black (5YR 2.5/1) fine sand; massive; friable; sand grains well coated with organic matter; few fine roots; gradual wavy boundary.

Bh2- 50 to 60 inches; dark reddish brown (5YR 3/2) fine sand; massive; friable; few fine roots; sand grains well coated with organic matter.

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(1) Taxadjunct to series - the depth to the Bh is outside the range defined for the St. Johns series, but the difference does not significantly affect the use or behavior of the soil.

SMT1- Smith Tract/Orange County

Transect 1, Pedon 2, St. Johns muck, depressional.

Sandy, siliceous, hyperthermic Typic Haplaquods

01- 5 to 3 inches; loose leaf litter.

02- 3 to 0 inches; root/leaf mat.

Oa- 0 to 3 inches; black (10YR 2/1) muck; weak medium granular structure; very friable; many fine and medium roots; abrupt smooth boundary.

A1- 3 to 5 inches; black (10YR 2/1) mucky fine sand; moderate medium granular structure; very friable; many fine, medium and coarse roots; abrupt smooth boundary.

A2- 5 to 7 inches; black (10YR 2/1) fine sand; 80% of soil particles are covered or coated with organic matter; weak coarse granular structure; very friable; many fine roots; abrupt wavy boundary.

A3- 7 to 9 inches; black (10YR 2/1) fine sand; 60% of soil particles are covered or coated with organic matter; weak coarse granular structure; very friable; common fine roots; clear wavy boundary.

E- 9 to 18 inches; dark gray (10YR 4/1) fine sand; common fine distinct black (10YR 2/1) streaks in old and new root channels; single grained; very friable; few fine roots; abrupt wavy boundary.

Bh1- 18 to 42 inches; black (5YR 2.5/1) fine sand; massive; friable; few fine roots; sand grains well coated with organic matter; gradual wavy boundary.

Bh2- 42 to 50 inches; dark reddish brown (5YR 3/2) fine sand; massive; friable; sand grains well coated with organic matter.

SMT1- Smith Tract/Orange County

Transect 1, Pedon 3, Hontoon muck, depressional.

Dysic, hyperthermic Typic Medisaprists

01- 3 to 0 inches; loose leaf litter.

Oa1- 0 to 6 inches; black (10YR 2/1) muck; 5% rubbed fibers; moderate coarse granular structure; very friable; many fine and medium roots; clear wavy boundary.

Oa2- 6 to 16 inches; dark reddish brown (5YR 3/2) muck; 10% rubbed fibers; weak coarse granular structure; very friable; many fine roots; gradual wavy boundary.

Oa3- 16 to 52 inches; black (10YR 2/1) muck; 5% rubbed fibers; massive; very friable; many fine common medium and coarse roots.

SMT1- Smith Tract/Orange County

Transect 1, Pedon 4, St. Johns muck.

Sandy, siliceous, hyperthermic Typic Haplaquods

01- 4 to 2 inches; loose leaf litter.

02- 2 to 0 inches; root/leaf mat.

Oa- 0 to 5 inches; black (5YR 2.5/1) muck; moderate medium granular structure; friable; many fine and medium, and few coarse roots; clear smooth boundary.

A1- 5 to 7 inches; black (10YR 2/1) fine sand; 70% of soil particles are covered or coated with organic matter; weak fine granular structure; very friable; many fine, common medium roots; abrupt smooth boundary.

A2- 7 to 12 inches; very dark gray (10YR 3/1) fine sand; few medium faint gray (10YR 5/1) pockets; weak coarse granular structure; very friable; many fine and few coarse roots; many uncoated sand grains; clear wavy boundary.

E- 12 to 18 inches; gray (10YR 5/1) fine sand; common fine distinct black (10YR 2/1) streaks along dead and live root channels which are 1/4 to 1/8 inch wide; weak coarse granular structure; very friable; many fine, medium and coarse roots; abrupt wavy boundary.

Bh1- 18 to 30 inches; black (5YR 2.5/1) fine sand; massive; very friable; few fine roots; sand grains are well coated with organic matter; clear wavy boundary.

Bh2- 30 to 38 inches; dark reddish brown (5YR 2.5/2) fine sand; massive; friable; few fine roots; sand grains coated with organic matter; gradual wavy boundary.

Bh3- 38 to 47 inches; dark brown (7.5YR 3/2) fine sand; massive; very friable; sand grains weakly coated with organic matter; gradual wavy boundary.

C- 47 to 60 inches; dark brown (10YR 3/3) fine sand; single grained; loose; many clean sand grains; sulfur smell.

THW- Tiger Creek - Headwaters/Polk County

Pedon 1, Smyrna fine sand.

Sandy, siliceous, hyperthermic Aeric Haplaquods

01- 1 to 0 inches; loose leaf litter.

A1- 0 to 6 inches; very dark gray (10YR 3/1) fine sand; many clean sand grains, approximately 25% of soil particles are covered or coated with organic matter; weak medium granular structure; very friable; many fine roots; clear wavy boundary.

A2- 6 to 11 inches; dark gray (10YR 4/1) fine sand; many clean sand grains, approximately 10% of soil particles are covered or coated with organic matter; weak medium granular structure; very friable; common fine roots; clear wavy boundary.

E- 11 to 15 inches; dark gray (10YR 4/1) fine sand; single grained; loose; few fine and common medium roots; abrupt wavy boundary.

Bh- 15 to 33 inches; black (5YR 2.5/1) fine sand; massive; friable; few fine roots; sand grains well coated with organic matter; gradual wavy boundary.

BC- 33 to 42 inches; dark grayish brown (10YR 4/2) fine sand; common medium faint very dark gray (10YR 3/1) Bh bodies; massive; very friable; few fine roots; gradual wavy boundary.

C- 42 to 60 inches; dark grayish brown (10YR 4/2) fine sand; single grained; loose.

THW- Tiger Creek - Headwaters/Polk County

Pedon 2, Evergreen muck, organic substratum frequently flooded (1).

Sandy, siliceous, thermic Histic Haplaquods

01- 4 to 3 inches; loose leaf litter.

02- 3 to 0 inches; leaf/root mat.

Oa- 0 to 9 inches; black (10YR 2/1) muck; less than 5% rubbed fibers; massive; very friable; many fine, few medium and coarse roots; abrupt smooth boundary.

C- 9 to 18 inches; grayish brown (10YR 5/2) sand; common medium distinct very dark grayish brown (10YR 3/2) streaks; few fine faint light brownish gray (10YR 6/2) mottles in splotchy pattern; single grained; loose; few fine roots; sulfur smell; abrupt smooth boundary.

2Ab1- 18 to 23 inches; dark brown (7.5YR 3/2) sand; massive; very friable; sand grains coated with organic matter; gradual wavy boundary.

2Ab2- 23 to 27 inches; dark reddish brown (5YR 3/3) sand; massive; very friable; sand grains coated with organic matter; gradual wavy boundary.

2cb- 27 to 45 inches; brown (10YR 5/3) sand; common coarse distinct dark reddish brown (5YR 3/2) bodies; single grained; loose; clear wavy boundary.

30ab- 45 to 60 inches; black (10YR 2/1) muck; massive; very friable.

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(1) Taxadjunct to series - the presence of the organic substratum and the soil temperature are outside the range defined for the Evergreen series; however, the difference does not significantly affect the use or behavior of the soil.

THW- Tiger Creek - Headwaters/Polk County

Pedon 3, Hontoon muck, frequently flooded.

Dysic, hyperthermic Typic Medisaprists

01- 3 to 1 inches; loose leaf litter.

02- 1 to 0 inches; root/leaf mat.

Oa1- 0 to 9 inches; black (10YR 2/1) muck; less than 5% rubbed fibers; massive; very friable; many fine, medium and coarse roots; sulfur smell; gradual wavy boundary.

Oa2- 9 to 60 inches; dark reddish brown (5YR 3/2) muck; less than 10% rubbed fibers; massive; very friable; few fine roots.

THW- Tiger Creek - Headwaters/Polk County

Pedon 4, Hontoon muck, frequently flooded.

Dysic, hyperthermic, Typic Medisaprists

01- 3 to 1 inches; loose leaf litter.

02- 1 to 0 inches; root/leaf mat.

Oa1- 0 to 8 inches; dark reddish brown (5YR 2.5/2) muck; less than 10% rubbed fibers; massive; very friable; many fine, medium and coarse roots; sulfur smell; clear wavy boundary.

Oa2- 8 to 60 inches; dark reddish brown (5YR 2.5/2) muck; less than 5% rubbed fibers; massive; very friable; many fine roots.

TRG- Tiger Creek, Red Gum Trail

Pedon 1, Placid muck, frequently flooded.

Sandy, siliceous, hyperthermic Typic Humaquepts

Oa- 0 to 4 inches; black (10YR 2/1) muck; less than 10% rubbed fibers; massive; very friable; many fine and few medium roots; sulfur smell; clear smooth boundary.

A1- 4 to 7 inches; dark grayish brown (10YR 4/2) fine sand; few medium distinct very dark grayish brown (10YR 3/2) streaks; single grained; loose; few medium roots; clear smooth boundary.

A2- 7 to 24 inches; very dark grayish brown (10YR 3/2) fine sand; 20% of soil particles are covered or coated with organic matter; single grained; friable; few medium roots; sulfur smell; clear smooth boundary.

C- 24 to 60 inches; brown (10YR 5/3) fine sand; loose; friable; few fine roots.

TRG- Tiger Creek, Red Gum Trail

Pedon 3, Basinger Mucky fine sand, depressional

Siliceous, hyperthermic Spodic Psammaquents

01- 2 to 0 inches; loose leaf litter.

A1- 0 to 3 inches; black (10YR 2/1) mucky fine sand; 90% of matrix is black; organic accretions 1 to 2 cm in diameter; strong medium granular structure; very friable; many fine and common medium roots; abrupt smooth boundary.

A2- 3 to 6 inches; black (10YR 2/1) fine sand; 90% of soil particles are covered or coated with organic matter; moderate medium granular structure; very friable; many fine and common medium roots; clear smooth boundary.

E- 6 to 11 inches; dark grayish brown (10YR 4/2) fine sand; single grained; loose; common fine and few coarse roots; gradual wavy boundary.

Bh- 11 to 50 inches; brown/dark brown (10YR 4/3) fine sand; 90% of soil particles are covered or coated with organic matter; single grained; loose; few fine roots; clear wavy boundary.

C- 50 to 60 inches; yellowish brown (10YR 5/4) fine sand; single grained; loose; gradual wavy boundary.

TRG- Tiger Creek, Red Gum Trail

Pedon 4, Basinger Fine sand.

Siliceous, hyperthermic Spodic Psammaquents

01- 2 to 0 inches; loose leaf litter.

A- 0 to 8 inches; very dark gray (10YR 3/1) fine sand; 20% of soil particles are covered or coated with organic matter; many fine distinct black (10YR 2/1) charcoal fragments; weak fine granular structure; very friable; many fine and medium and few coarse roots; abrupt smooth boundary.

E- 8 to 24 inches; dark grayish brown (10YR 4/2) fine sand; few fine faint dark gray (10YR 4/1) mottles in splotchy pattern; weak coarse granular structure; very friable; many fine and medium roots; clear wavy boundary.

Bw- 24 to 60 inches; dark brown (10YR 3/3) fine sand; single grained; many uncoated sand grains; loose.

TRG- Tiger Creek, Red Gum Trail

Pedon 5, St. Johns fine sand, organic substratum (1).

Sandy, siliceous, hyperthermic Typic Haplaquods

01- 5 to 3 inches; loose leaf litter.

02- 3 to 0 inches; root/leaf mat.

A- 0 to 11 inches; black (10YR 2/1) fine sand; 30% of soil particles are covered or coated with organic matter; weak fine granular structure; very friable; many fine and common medium roots, few coarse roots at the boundary of the A and E horizons; clear wavy boundary.

E- 11 to 18 inches; dark grayish brown (10YR 4/2) fine sand; single grained; loose; many fine roots; clear wavy boundary.

Bh- 18 to 21 inches; dark brown (7.5YR 3/2) fine sand, sand grains coated with organic matter; massive; very friable; many fine roots; clear wavy boundary.

E/Bh- 21 to 38 inches; dark brown (7.5YR 4/2) fine sand (E'); common medium dark brown (7.5YR 3/2) Bh bodies; single grained; loose; few fine roots; gradual wavy boundary.

2Oa- 38 to 60 inches; dark reddish brown (5YR 3/2) muck; less than 10% rubbed fiber; massive; very friable; few fine roots.

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(1) Taxadjunct to series - the presence of the organic substratum is outside the range defined for the St. Johns series; however, the difference does not significantly affect the use or behavior of the soil.

TRG- Tiger Creek, Red Gum Trail

Pedon 6, Pomello fine sand, organic substratum.

Sandy, siliceous, hyperthermic Arenic Haplohumods

01- 2 to 1 inches; loose leaf litter.

02- 1 to 0 inches; root/leaf mat.

A1- 0 to 4 inches; black (10YR 2/1) fine sand; 20% of sand grains covered or coated with organic matter; moderate fine granular structure; very friable; many fine and common medium roots; clear smooth boundary.

A2- 4 to 7 inches; very dark gray (10YR 3/1) fine sand; single grained; loose; many fine, few medium and coarse roots; gradual wavy boundary.

E1- 7 to 22 inches; gray (10YR 5/1) fine sand; single grained; loose; common fine roots; gradual wavy boundary.

E2- 22 to 30 inches; grayish brown (10YR 5/2) fine sand; common medium faint gray (10YR 5/1) mottles; single grained; loose; few fine roots; clear wavy boundary.

Bh1- 30 to 35 inches; dark brown (7.5YR 3/2) fine sand; few fine faint brown (7.5YR 5/2) mottles; single grained; loose; few fine roots; 90% of sand grains coated with organic matter; clear wavy boundary.

Bh2- 35 to 40 inches; dark reddish brown (5YR 3/2) fine sand; massive; friable; few fine roots; sand grains well coated with organic matter; gradual wavy boundary.

Bw/Bh- 40 to 50 inches; brown/dark brown (7.5YR 4/4) (Bh) fine sand; common coarse distinct dark brown (7.5YR 3/2) Bh bodies; single grained; loose; few fine roots; 75% of sand grains thinly coated with organic matter; clear wavy boundary.

2Oa1- 50 to 55 inches; black (10YR 2/1) mucky fine sand; moderate medium granular structure; very friable; many fine roots; clear wavy boundary.

2Oa2- 55 to 60 inches; dark reddish brown (5YR 2.5/2) muck; many fine faint black (10YR 2/1) spots; massive; friable; many fine roots.

TRG- Tiger Creek, Red Gum Trail

Pedon 7, Zolfo fine sand.

Sandy, siliceous, hyperthermic Grossarenic Entic Haplohumods

01- 3 to 2 inches; loose leaf litter.

02- 2 to 0 inches; root/leaf mat.

A1- 0 to 7 inches; black (10YR 2/1) fine sand; 25% of soil particles are covered or coated with organic matter; moderate medium granular structure; very friable; many fine medium and coarse roots; clear wavy boundary.

A2- 7 to 11 inches; very dark gray (10YR 3/1) fine sand; single grained; loose; many fine and common medium roots; clear wavy boundary.

E1- 11 to 24 inches; gray (10YR 5/1) fine sand; single grained; loose; few fine roots; clear wavy boundary.

E2- 24 to 35 inches; light gray (10YR 7/1) fine sand; common medium faint light brownish gray (10YR 6/2) bodies; single grained; loose; few fine roots; gradual wavy boundary.

Bh1- 35 to 40 inches; brown (7.5YR 4/2) fine sand; 95% of sand grains are thinly coated with organic matter; single grained; loose.

Bh2- 40 to 60 inches; brown (7.5YR 4/2) fine sand; common coarse faint dark brown (7.5YR 3/2) mottles; sand grains thinly coated with organic matter.

WSR2- Windsor/ Alachua County

Transect 1, Pedon 1, Wauchula fine sand (1).

Sandy, siliceous, hyperthermic Ultic Haplaquods

01- 2 to 0 inches; loose leaf litter.

A1- 0 to 2 inches; black (10YR 2/1) fine sand 70% of soil particles are covered or coated with organic matter; weak fine granular structure; very friable; many fine and common medium roots; abrupt smooth boundary.

A2- 2 to 7 inches; black (10YR 2/1) fine sand; 70% of soil particles are covered or coated with organic matter; moderate medium granular structure; very friable; many fine and medium, common coarse roots; clear wavy boundary.

A3- 7 to 12 inches; black (10YR 2/1) fine sand; 50% of soil particles are covered or coated with organic matter; weak coarse granular structure; very friable; few fine, medium and coarse roots; clear wavy boundary.

A4- 12 to 21 inches; very dark gray (10YR 3/1) fine sand; weak coarse granular structure; very friable; few fine, medium and coarse roots; abrupt wavy boundary.

Bh1- 21 to 23 inches; dark reddish brown (5YR 2.5/2) fine sand; many medium distinct dark reddish brown (5YR 3/2) mottles; massive; firm; few fine roots; sand grains well coated with organic matter; clear wavy boundary.

Bh2- 23 to 28 inches; dark reddish brown (5YR 2.5/2) loamy fine sand; many medium distinct dark reddish brown (10YR 3/2) mottles; massive; friable; few fine roots; abrupt wavy boundary.

Btg1- 28 to 40 inches; grayish brown (10YR 5/2) sandy clay loam; common medium distinct brown (7.5YR 3/2) mottles; common fine prominent strong brown (7.5YR 5/8) and yellowish red (5YR 5/8) mottles around root channels; moderate coarse subangular blocky structure; friable; few fine roots; sand grains coated and bridged with clay; gradual wavy boundary.

Btg2- 40 to 55 inches; pale red (2.5Y 6/2) sandy clay; many fine prominent yellowish red (5YR 5/8) mottles along root channels; weak, very coarse subangular blocky structure; firm; few fine roots; sand grains coated and bridged with clay; gradual wavy boundary.

Btg3- 55 to 60 inches; pale red (2.5YR 6/2) sandy clay; common fine prominent light red (2.5YR 6/6) mottles (some are located along root channels); weak, very coarse subangular blocky structure; firm; few fine roots; sand grains coated and bridged with clay.

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(1) Taxadjunct to series - the very thick black A horizon and the absence of an E horizon are outside the range defined for the Wauchula series; however, the difference does not significantly affect the use or behavior of the soil.

WSR2- Windsor/ Alachua County

Transect 1, Pedon 2, Goldhead mucky fine sand, depressional.

Loamy, siliceous, thermic Arenic Ochraqualfs

01- 2 to 0 inches; loose leaf litter.

A1- 0 to 2 inches; black (10YR 2/1) mucky fine sand; 80% of matrix is black; moderate medium granular structure; very friable; many fine roots; abrupt smooth boundary.

A2- 2 to 5 inches; black (10YR 2/1) fine sand; common medium distinct grayish brown (10YR 5/2) spots of sand grains uncovered by organic matter; moderate medium granular structure; very friable; many fine, medium and coarse roots; many uncoated sand grains; common 0.5- to 1.0-cm organic accretions; clear wavy boundary.

E- 5 to 16 inches; dark grayish brown (10YR 4/2) fine sand; common fine distinct black (10YR 2/1) streaks that occur in irregular horizontal and vertical patterns; weak coarse granular structure; very friable; few fine and medium roots; gradual wavy boundary.

Bw- 16 to 23 inches; black (10YR 2/1) loamy fine sand; weak coarse subangular blocky structure; very friable; few fine roots; sand grains thinly coated with clay; clear wavy boundary.

Btg1- 23 to 27 inches; black (10YR 2/1) sandy clay loam; many fine prominent white (10YR 8/1) calcium carbonate bodies; weak, very coarse subangular blocky structure; friable; few fine roots; sand grains bridged and coated with clay; gradual wavy boundary.

Btg2- 27 to 32 inches; very dark gray (10YR 3/1) sandy clay; common fine faint black (10YR 2/1) mottles; weak, very coarse subangular blocky structure; firm; few fine roots; sand grains bridged and coated with clay; gradual wavy boundary.

Btg3- 32 to 48 inches; very dark grayish brown (10YR 3/2) sandy clay; common fine prominent yellowish brown (10YR 5/6) and few medium distinct very dark gray (10YR 3/1) mottles; weak, very coarse subangular blocky structure; firm; few fine roots; sand grains bridged and coated with clay; gradual wavy boundary.

Btg4- 48 to 60 inches; light brownish gray (10YR 6/2) sandy clay; few medium distinct black (10YR 2/1) bodies of sand grains covered by organic matter; sand grains bridged and coated with clay; weak, very coarse subangular blocky structure; firm; few medium roots.

WSR2- Windsor/ Alachua County

Transect 1, Pedon 3, Ledwith muck, depressional.

Fine, montmorillonitic, hyperthermic Mollic Albaqualfs

Oa - 0 to 4 inches; black (10YR 2/1) muck; moderate fine granular structure; very friable; many fine, common medium and few coarse roots; abrupt smooth boundary.

A1- 4 to 9 inches; black (10YR 2/1) mucky fine sand (100% black); few accretions approximately 1 cm in diameter; weak coarse granular structure; very friable; few fine roots; clear smooth boundary.

A2 - 9 to 13 inches; black (10YR 2/1) fine sand; 40% of soil particles are covered or coated with organic matter; common medium distinct gray (10YR 5/1) bodies; weak coarse granular structure; very friable; few fine roots; abrupt smooth boundary.

Eg- 13 to 30 inches; grayish brown (10YR 5/2) fine sand; few fine faint dark grayish brown (10YR 4/2) mottles; single grained; loose; abrupt wavy boundary.

Btg1- 30 to 42 inches; black (10YR 2/1) sandy clay loam; common medium distinct dark grayish brown (10YR 4/2) mottles; weak, very coarse subangular blocky structure; friable; sand grains bridged and coated with clay; gradual wavy boundary.

Btg2- 42 to 50 inches; grayish brown (2.5Y 5/2) sandy clay; weak, very coarse subangular blocky structure; friable; sand grains bridged and coated with clay.

WSR2- Windsor/Alachua County

Transect 1, Pedon 4, Plummer fine sand, depressional.

Loamy, siliceous, thermic Grossarenic Paleaquults

01- 4 to 2 inches; loose leaf litter.

02- 2 to 0 inches; root/leaf mat.

A- 0 to 5 inches; black (10YR 2/1) fine sand; 80% of soil particles are covered or coated with organic matter; medium coarse granular structure; very friable; many fine, medium and coarse roots; clear wavy boundary.

E1- 5 to 22 inches; gray (10YR 6/1) fine sand; common medium distinct dark gray (10YR 4/1) vertical streaks; single grained; loose; few fine and coarse roots; gradual wavy boundary.

E2- 22 to 28 inches; brown (10YR 5/3) fine sand; single grained; loose; few fine roots; gradual wavy boundary.

E3- 28 to 42 inches; grayish brown (10YR 5/2) fine sand; common medium distinct dark brown (7.5YR 4/2) mottles; single grained; loose; abrupt wavy boundary.

Btg- 42 to 50 inches; very dark gray (10YR 3/1) sandy clay loam; weak, very coarse subangular blocky structure; firm; sand grains bridged and coated with clay.

WTA1- Withlacoochee/Hernando County

Transect 1, Pedon 1, Wabasso fine sand

01- 4 to 3 inches; loose leaf litter.

02- 3 inches; root/leaf mat

A1 - 0 to 5 inches; black (10YR 2/1) fine sand; 55% of soil particles are covered or coated with organic matter; weak medium granular structure; very friable; many fine, few medium and coarse roots; clear smooth boundary.

A2 - 5 to 10 inches; very dark gray (10YR 3/1) fine sand; 25% of soil particles are covered or coated with organic matter; single grained; loose; few fine and common medium roots; clear smooth boundary.

E1 - 10 to 12 inches; dark gray (10YR 4/1) fine sand; single grained; loose; few fine and medium, and common coarse roots; clear smooth boundary.

E2 - 12 to 18 inches; grayish brown (10YR 5/2) fine sand; common medium faint dark grayish brown (10YR 4/2) bodies; single grained; loose; few fine and coarse, and common medium roots; abrupt wavy boundary.

Bh1 - 18 to 20 inches; dark brown (7.5YR 3/2) fine sand; massive; very friable; few uncoated sand grains; few fine and common medium roots; clear wavy boundary.

Bh2 - 20 to 22 inches; black (5YR 2.5/1) fine sand; massive friable; few fine and common medium roots; few uncoated sand grains; clear wavy boundary.

Btg1 - 22 to 24 inches; dark brown (7.5YR 4/2) fine sandy loam; common medium distinct very dark reddish brown (5YR 2/2) Bh bodies; weak medium subangular blocky structure; friable; common fine roots; sand grains coated and bridged with clay; clear wavy boundary.

Btg2 - 24 to 28 inches; light brownish gray (10YR 6/2) sandy clay loam; few medium distinct very dark grayish brown (10YR 3/2) bodies and many fine prominent strong brown (7.5YR 5/8) mottles around roots; moderate medium subangular blocky structure; friable; common fine roots; sand grains coated and bridged with clay; gradual wavy boundary.

Btg3 - 28 to 35 inches; light brownish gray (10YR 6/2) sandy clay loam; many fine distinct brownish yellow (10YR 6/8) mottles and few fine distinct very dark grayish brown (10YR 3/2) bodies around roots; weak very coarse subangular blocky structure; firm; few fine roots; sand grains coated and bridged with clay; gradual wavy boundary.

Btg4 - 35 to 38 inches; light brownish gray (10YR 6/2) sandy clay; many fine distinct brownish yellow (10YR 6/8) mottles and few fine distinct very dark grayish brown (10YR 3/2) bodies around roots; massive; firm; few fine roots; sand grains coated and bridged with clay; gradual wavy boundary.

Btgk - 38 to 60 inches; olive gray (5YR 5/2) sandy clay; many coarse distinct white (10YR 8/2) calcium carbonate nodules and few medium distinct yellow (2.5Y 7/6) mottles; massive; firm; few fine roots; sand grains coated and bridged with clay.

WTA1- Withlacoochee/Hernando County

Transect 1, Pedon 2, St. Johns fine sand

01- 3 to 2 inches; loose leaf litter.

02- 2- 0 inches; root/leaf mat

A1 - 0 to 3 inches; black (10YR 2/1) mucky fine sand; weak fine granular structure; very friable; many fine and medium and few coarse roots; abrupt smooth boundary.

A2 - 3 to 11 inches; very dark gray (10YR 3/1) fine sand; 30 percent of soil particles are covered or coated with organic matter; single grained; loose; few fine and coarse, and common medium roots; clear wavy boundary.

E1 - 11 to 15 inches dark gray (10YR 4/1) fine sand; single grained; loose; few fine and common medium roots; clear wavy boundary.

E2 - 15 to 26 inches; grayish brown (10YR 5/2) fine sand; few medium distinct very dark gray (10YR 3/1) streaks along roots; single grained; loose; few fine roots; abrupt wavy boundary.

Bh1 - 26 to 30 inches; black (10YR 2/1) fine sand; massive; friable; few fine roots; few uncoated sand grains; abrupt wavy boundary.

Bh2 - 30 to 40 inches; very dark brown (10YR 2/2) fine sand; massive; friable; few fine roots; few uncoated sand grains; clear wavy boundary.

BC1 - 40 to 50 inches; dark brown (7.5YR 3/3) fine sand; single grained; loose, gradual wavy boundary.

BC2 - 50 to 60 inches; brown (7.5YR 4/4) fine sand; single grained; loose.

WTA1- Withlacoochee/Hernando County

Transect 1, Pedon 3, Allanton mucky fine sand, depressional (1)

Sandy, siliceous, hyperthermic Alfic Haplaquods

01- 1 to 0 inches; loose leaf litter.

Oa- 0 to 1 inches; dark reddish brown (5YR 2.5/2) muck; weak fine granular structure; very friable; many fine roots; abrupt smooth boundary.

A1- 1 to 23 inches; very dark brown (10YR 2/2) mucky fine sand; common medium distinct gray (10YR 6/1) mottles; many uncoated sand grains; many accretions; stratification of organic matter (black thin horizontal layers at 1/4 to 1/2 inch thick); medium coarse granular structure; very friable; few fine and medium roots; gradual boundary.

A2- 23 to 35 inches; very dark gray (10YR 3/1) fine sand; common medium distinct light brownish gray (10YR 6/2) streaks of uncoated sand; 30% of soil particles are covered or coated with organic matter; weak coarse granular structure; very friable; gradual wavy boundary.

E- 35 to 40 inches; dark gray (10YR 4/1) fine sand; single grained; loose; gradual wavy boundary.

Bw/Bh- 40 to 55 inches; brown/dark brown (7.5YR 4/2) fine sand; common medium faint dark brown (7.5YR 3/2) Bh bodies; single grained; very friable; gradual wavy boundary.

Bh- 55 to 60 inches; dark brown (7.5YR 3/2) fine sand; common medium distinct black (5YR 2/1) mottles; massive; very friable; sand grains well coated with organic matter.

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(1) Taxadjunct to series - the soil temperature is outside the range defined for the Allanton series, but the difference does not significantly affect the use or behavior of the soil.

WTA1- Withlacoochee/Hernando County

Transect 1, Pedon 4, Wabasso fine sand.

Sandy, siliceous, hyperthermic Alfic Haplaquods

01- 3 to 2 inches; loose leaf litter.

02- 2 to 0 inches; leaf/root mat.

A- 0 to 5 inches; black (10YR 2/1) fine sand; 40% of soil particles are covered or coated with organic matter; moderate medium granular structure; friable; few fine, medium and coarse roots; clear smooth boundary.

E1- 5 to 9 inches; dark gray (10YR 4/1) fine sand, weak medium granular structure; very friable; few fine and coarse roots; gradual wavy boundary.

E2- 9 to 13 inches; grayish brown (10YR 5/2) fine sand; common medium faint light grayish brown (10YR 6/2) mottles in splotchy pattern; weak coarse granular structure; very friable; few fine and coarse roots; abrupt smooth boundary.

Bh- 13 to 19 inches; dark reddish gray (5YR 4/2) fine sand; massive structure; very friable; few fine roots; clear smooth boundary.

BE- 19 to 21 inches; dark grayish brown (10YR 4/2) loamy fine sand; common medium faint very dark grayish brown (10YR 3/2) streaks; many fine prominent strong brown (7.5YR 5/8) mottles; weak coarse subangular blocky structure; very friable; few fine roots; abrupt smooth boundary.

Btg1- 21 to 25 inches; light brownish gray (10YR 6/2) fine sandy loam; many fine prominent yellowish red (5YR 5/8) mottles; common medium distinct brown (7.5YR 5/2) streaks; weak coarse subangular blocky structure; very friable; few fine roots; abrupt smooth boundary.

Btg2- 25 to 37 inches; light brownish gray (10YR 6/2) sandy clay loam; many fine prominent yellowish red (5YR 5/8) mottles; common medium distinct brown (7.5YR 5/2) streaks; weak coarse subangular blocky structure; very friable; few fine roots; gradual wavy boundary.

Cg1- 37 to 48 inches; light brownish gray (2.5Y 6/2) sandy clay; many medium prominent yellowish brown (10YR 5/8) mottles; massive; firm; few fine roots; gradual wavy boundary.

Cg2- 48 to 60 inches; light olive gray (5Y 6/2) clay; many medium prominent yellowish brown (10YR 5/8) mottles; massive; very firm.

WTA2- Withlacoochee/Hernando County

Transect 2, Pedon 1, Wabasso fine sand.

Loamy, siliceous, hyperthermic Entic Haplohumods

01- 3 to 2 inches; loose leaf litter.

02- 2 to 0 inches; leaf/root mat.

A- 0 to 5 inches; black (10YR 2/1) fine sand; 40% of soil particles are covered or coated with organic matter; moderate medium granular structure; friable; few fine, medium and coarse roots; clear smooth boundary.

E1- 5 to 9 inches; dark gray (10YR 4/1) fine sand, weak medium granular structure; very friable; few fine and coarse roots; gradual wavy boundary.

E2- 9 to 13 inches; grayish brown (10YR 5/2) fine sand; common medium faint light grayish brown (10YR 6/2) mottles in splotchy pattern; weak coarse granular structure; very friable; few fine and coarse roots; abrupt smooth boundary.

Bh- 13 to 19 inches; dark reddish gray (5YR 4/2) fine sand; massive structure; very friable; few fine roots; clear smooth boundary.

BE- 19 to 21 inches; dark grayish brown (10YR 4/2) loamy fine sand; common medium faint very dark grayish brown (10YR 3/2) streaks; many fine prominent strong brown (7.5YR 5/8) mottles; weak coarse subangular blocky structure; very friable; few fine roots; abrupt smooth boundary.

Btg1- 21 to 25 inches; light brownish gray (10YR 6/2) fine sandy loam; many fine prominent yellowish red (5YR 5/8) mottles; common medium distinct brown (7.5YR 5/2) streaks; weak coarse subangular blocky structure; very friable; few fine roots; abrupt smooth boundary.

Btg2- 25 to 37 inches; light brownish gray (10YR 6/2) sandy clay loam; many fine prominent yellowish red (5YR 5/8) mottles; common medium distinct brown (7.5YR 5/2) streaks; weak coarse subangular blocky structure; very friable; few fine roots; gradual wavy boundary.

Cg1- 37 to 48 inches; light brownish gray (2.5Y 6/2) sandy clay; many medium prominent yellowish brown (10YR 5/8) mottles; massive; firm; few fine roots; gradual wavy boundary.

Cg2- 48 to 60 inches; light olive gray (5Y 6/2) clay; many medium prominent yellowish brown (10YR 5/8) mottles; massive; very firm.

WTA2- Withlacoochee/Hernando County

Transect 2, Pedon 2, Felda fine sand.

Sandy or sandy-skeletal, siliceous, dysic, hyperthermic, Grossarenic Haplaquods

01- 1 to 0 inches; loose leaf litter.

A1- 0 to 2 inches; very dark gray (10YR 3/1) fine sand; 40% of soil particles are covered or coated with organic matter; weak fine granular structure; very friable; many fine roots; abrupt smooth boundary;

A2- 2 to 7 inches; dark gray (10YR 4/1) fine sand; 30% of soil particles are covered or coated with organic matter; common medium faint gray (10YR 5/1) streaks; few medium faint organic accretions; moderate medium granular structure; very friable; many fine and common medium roots; clear wavy boundary.

Eg1- 7 to 11 inches; grayish brown (10YR 5/2) fine sand; common, medium distinct light gray (10YR 7/2) splotches; few, fine, prominent strong brown (7.5YR 5/8) oxidized rhizosperes along dead and live root channels; few fine distinct black (10YR 2/1) streaks along old root channels; moderate medium granular structure; very friable; few fine and medium roots; clear wavy boundary.

Eg2- 11 to 27 inches; light brownish gray (10YR 6/2) fine sand; few fine prominent strong brown (7.5YR 5/8) and few fine distinct very dark gray (10YR 3/1) streaks along old root channels; single grained; loose; gradual wavy boundary.

Btg1- 27 to 43 inches; light olive gray (5Y 6/2) sandy clay loam; common fine prominent strong brown (7.5YR 5/8) streaks along old root channels; friable; weak coarse subangular blocky structure; many fine and few coarse roots; sand grains bridged and coated with clay; gradual wavy boundary.

Btg2- 43 to 60 inches; light gray/gray (5Y 6/1) sandy clay; common medium distinct light yellowish brown (2.5Y 6/4) mottles and common medium prominent very dark gray (10YR 3/1) streaks along root channels; weak, very coarse subangular blocky structure; friable; few coarse roots; sand grains bridged and coated with clay.

WTA2- Withlacoochee/Hernando County

Transect 2, Pedon 3 Samsula muck, depressional.

Sandy or sandy-skeletal, siliceous, dysic, hyperthermic, Grossarenic Haplaquods

Oa1- 0 to 2 inches; black (10YR 2/1) muck; less than 5% rubbed fiber; moderate fine granular structure; very friable; many fine roots; clear abrupt boundary.

Oa2- 2 to 10 inches; very dark brown (10YR 2/2) muck; less than 5% rubbed fiber; common coarse faint black (10YR 2/1) mottles; moderate fine granular structure; very friable; many fine roots; clear wavy boundary.

Oa3- 10 to 42 inches; black (10YR 2/1) muck; less than 10% rubbed fiber; common coarse faint very dark brown (10YR 2/2) mottles; moderate fine granular structure; very friable; many fine roots; sulfur smell; clear wavy boundary.

C- 42 to 44 inches; black (10YR 2/1) mucky fine sand; medium granular structure; very friable; clear smooth boundary.

Cg- 44 to 52 inches; dark gray (10YR 4/1) fine sand; single grained; loose.

WTA2- Withlacoochee/Hernando County

Transect 2, Pedon 4, Holopaw muck, depressional.

Loamy, siliceous, hyperthermic, Grossarenic Ochraqualfs

Oa- 0 to 6 inches; black (10YR 2/1) muck; weak fine granular structure; very friable; few fine roots; less than 5% rubbed fiber; abrupt smooth boundary.

A- 6 to 8 inches; black (10YR 2/1) fine sand, 90% of soil particles are covered or coated with organic matter; weak, coarse granular structure; very friable; few fine roots; abrupt smooth boundary.

Eg1- 8 to 10 inches; light brownish gray (10YR 6/2) fine sand; thin (1/16 to 1/8 inch) horizontal and vertical black (10YR 2/1) streaks; single grained; loose; few fine roots; abrupt smooth boundary.

Eg2- 10 to 45 inches; light brownish gray (10YR 6/2) fine sand; single grained; loose; few fine roots; abrupt wavy boundary.

Btg- 45 to 60 inches; grayish brown (2.5Y 5/2) sandy clay loam; weak, very coarse sub-angular blocky structure; friable.

WTA3- Withlacoochee/Hernando County

Transect 3, Pedon 1, Wabasso fine sand.

Sandy, siliceous, hyperthermic Alfic Haplaquods

01- 3.5 to 2.5 inches; loose leaf litter.

02- 2.5 to 0 inches; root/leaf mat.

A1- 0 to 4 inches; black (10YR 2/1) fine sand; 45% of soil particles are covered or coated with organic matter, weak medium granular structure; very friable; few fine and common medium roots; clear smooth boundary.

A2- 4 to 7 inches; very dark gray (10YR 3/1) fine sand; 40% of soil particles are covered or coated with organic matter; weak coarse granular structure; very friable; few fine and medium roots; clear wavy boundary.

AE- 7 to 10 inches: dark gray (10YR 4/1) fine sand; weak coarse granular structure; very friable; few fine, common medium and coarse roots; clear wavy boundary.

E- 10 to 17 inches; gray (10YR 5/1) fine sand; single grained; loose; few fine and coarse roots; clear smooth boundary.

Bh1- 17 to 20 inches; black (5YR 2.5/1) fine sand; massive; few fine roots; sand grains very thinly coated with organic matter; clear smooth boundary.

Bh2- 20 to 24 inches; dark brown (7.5YR 3/2) fine sand; massive; friable; few fine roots; sand grains well coated with organic matter; clear wavy boundary.

Bh3- 24 to 26 inches; brown/dark brown (7.5YR 4/4) fine sand; massive; very friable; sand grains well coated with organic matter; clear wavy boundary.

E'- 26 to 28 inches; pale brown (10YR 6/3) fine sand; single grained; loose; sand grains thinly coated with organic matter;

Btg1- 28 to 30 inches; brown (10YR 5/3) fine sandy loam; few fine prominent yellowish red (5YR 5/8) mottles; weak fine subangular blocky structure; very friable; sand grains bridged and coated with clay; clear smooth boundary.

Btg2- 30 to 47 inches; light brownish gray (2.5YR 6/2) sandy clay loam; many fine prominent yellowish red (5YR 4/6) mottles; common fine prominent strong brown (7.5YR 5/8) mottles; weak coarse subangular blocky structure; friable; sand grains bridged and coated with clay; gradual wavy boundary.

Btg3- 47 to 60 inches; light brownish gray (10YR 6/2) sandy clay loam; common fine distinct brownish yellow (10YR 6/6) mottles; weak, very coarse subangular blocky structure; firm; sand grains bridged and coated with clay.

WTA3- Withlacoochee/Hernando County

Transect 3, Pedon 2, Paisley mucky loamy fine sand.

Fine, montmorillonitic, hyperthermic Mollic Albaqualfs

01- 2 to 1 inches; loose leaf litter.

02- 1 to 0 inches; root/leaf mat.

A1- 0 to 3 inches; black (10YR 2/1) mucky loamy fine sand; 70% of soil particles are covered or coated with organic matter; moderate medium granular structure; friable; common fine and medium, few coarse roots; clear wavy boundary.

A2- 3 to 6 inches; black (10YR 2/1) loamy/fine sand; 70% of soil particles are covered or coated with organic matter; weak medium subangular blocky structure; friable; few fine and coarse roots; clear wavy boundary.

E- 6 to 10 inches; dark gray (10YR 4/1) fine sand; few fine faint gray (10YR 5/1) and common medium faint grayish brown (10YR 5/2) mottles in splotchy pattern; weak coarse granular structure; very friable; few fine roots; abrupt wavy boundary.

Btg1- 10 to 11 inches; dark gray (10YR 4/1) fine sandy loam; few fine prominent strong brown (7.5YR 5/8) mottles; moderate medium subangular blocky structure; friable; few fine roots; sand grains bridged and coated with clay; abrupt smooth boundary.

Btg2- 11 to 13 inches; yellowish brown (10YR 5/8) sandy clay loam; weak, very coarse subangular blocky structure; friable; few fine roots; sand grains bridged and coated with clay; abrupt wavy boundary.

Btg3- 13 to 18 inches; yellowish brown (10YR 5/8) sandy clay loam; common medium distinct light brownish gray (10YR 6/2) and few fine prominent strong brown (7.5YR 5/8) mottles; weak, very coarse subangular blocky structure; friable; sand grains bridged and coated with clay; gradual wavy boundary.

Btg4- 18 to 35 inches; light gray (5Y 7/2) sandy clay; common fine prominent strong brown (7.5YR 5/8) mottles; sand grains bridged and coated with clay; sand accumulation in old root channels; weak, very coarse subangular blocky structure; firm; gradual wavy boundary.

Cg1- 35 to 45 inches; light gray (5Y 7/2) sandy clay loam; common few prominent strong brown (7.5YR 5/8) mottles; massive; friable; gradual wavy boundary.

Cg2- 45 to 50 inches; light gray (2.5Y 7/2) fine sandy loam; few fine prominent yellowish brown (10YR 5/6) splotches and few fine faint light gray (10YR 6/1) splotches; massive; friable.

Cg3- 50 to 55 inches; light gray (10YR 7/1) sandy clay loam; massive; friable;

2R- 55 inches; limestone.

WTA3- Withlacoochee/Hernando County

Transect 3, Pedon 3, Samsula muck, depressional.

Sandy or sandy-skeletal, siliceous, dysic, hyperthermic Terric Medisaprists

Oa1- 0 to 2 inches; black (10YR 2/1) muck; less than 5% rubbed fiber; moderate fine granular structure; very friable; many fine roots; clear abrupt boundary.

Oa2- 2 to 10 inches; very dark brown (10YR 2/2) muck; less than 5% rubbed fiber; common coarse faint black (10YR 2/1) mottles; moderate fine granular structure; very friable; many fine roots; clear wavy boundary.

Oa3- 10 to 42 inches; black (10YR 2/1) muck; less than 10% rubbed fiber; common coarse faint very dark brown (10YR 2/2) mottles; moderate fine granular structure; very friable; many fine roots; sulfur smell; clear wavy boundary.

C- 42 to 44 inches; black (10YR 2/1) mucky fine sand; medium granular structure; very friable; clear smooth boundary.

Cg- 44 to 52 inches; dark gray (10YR 4/1) fine sand; single grained; loose.

WTA5- Withlacoochee/Hernando County

Transect 5, Pedon 1, Paisley fine sand.

Fine, montmorillonitic, hyperthermic Typic Albaqualfs

01- 2 to 0 inches; loose leaf litter.

A1- 0 to 2 inches; very dark gray (10YR 3/1) fine sand; weak fine granular structure; very friable; many fine, common medium roots; many clean sand grains; abrupt smooth boundary.

A2- 2 to 6 inches; very dark gray (10YR 3/1) fine sand; moderate medium granular structure; very friable; few fine and common medium roots; many clean sand grains; clear smooth boundary.

A3- 6 to 10 inches; dark grayish brown (10YR 4/2) fine sand; common large limestone boulders; single grained; loose; few fine roots; abrupt smooth boundary.

Btg1- 10 to 14 inches; dark grayish brown (10YR 4/2) sandy clay; common fine distinct black (10YR 2/1) streaks along root channels; few prominent strong brown (7.5YR 5/8) mottles and common medium prominent yellowish brown (10YR 5/8) mottles; weak, very coarse subangular blocky structure; firm; few fine roots; clear wavy boundary.

Btgk2- 14 to 30 inches; gray (10YR 5/1) sandy clay loam; weak, very coarse subangular blocky structure; firm; few fine and coarse roots; many fine secondary distinct calcium carbonate nodules; clear wavy boundary.

Cg1- 30 to 40 inches; light gray (10YR 7/2) sandy clay loam; many fine faint calcium carbonate nodules; massive; very firm; diffuse irregular boundary.

Cg2- 40 to 60 inches; gray (10YR 5/1) sandy clay loam; many fine distinct yellowish brown (10YR 5/6) mottles; many fine distinct light brownish gray (10YR 6/2) calcium carbonate nodules; massive; very firm.

WTA5- Withlacoochee/Hernando County

Transect 5, Pedon 2, Punta fine sand.

Sandy, siliceous, hyperthermic Grossarenic Haplaquods

01- 3 to 2 inches; loose leaf litter.

02- 2 to 0 inches; root/leaf mat.

A1- 0 to 5 inches; black (10YR 2/1) fine sand; 60% of soil particles are covered or coated with organic matter; moderate medium granular structure; very friable; many fine, common medium roots; organic accretions; gradual wavy boundary.

A2- 5 to 10 inches; very dark gray (10YR 3/1) fine sand; 20% of soil particles are covered or coated with organic matter; few fine distinct black (10YR 2/1) streaks along root channels; moderate medium granular structure; very friable; few medium roots; gradual wavy boundary.

E1- 10 to 38 inches; gray (10YR 5/1) fine sand; few fine distinct black (10YR 2/1) stained root channels; single grained; loose; few fine roots; gradual wavy boundary.

E2- 38 to 55 inches; dark grayish brown (10YR 4/2) fine sand; few fine distinct black (10YR 2/1) stains along root channels; single grain; loose; few fine roots.

Bh- 55 to 60 inches; dark brown (7.5YR 3/2) fine sand; single grained; sand grains coated with organic matter; loose.

WTA5- Withlacoochee/Hernando County

Transect 5, Pedon 3, Zephyr muck, depressional.

Fine-loamy, siliceous, hyperthermic Histic Ochraquults

Oa- 0 to 11 inches; black (10YR 2/1) muck; less than 10% rubbed fiber; massive; friable; many fine roots; clear wavy boundary.

A- 11 to 14 inches; black (10YR 2/1) fine sand; 70% of soil particles are covered or coated with organic matter; massive; friable; common fine roots; clear smooth boundary.

Eg1- 14 to 17 inches; dark gray (10YR 4/1) fine sand; single grained; loose; few fine roots; sulfur smell; ferrous iron test produced a faint pink color; clear wavy boundary.

Eg2 - 17 to 30 inches; grayish brown (10YR 5/2) fine sand; single grained; loose; abrupt wavy boundary.

Btg - 30 to 50 inches; grayish brown (2.5Y 5/2) sandy clay loam; weak, very coarse subangular blocky structure; friable.

WTA5- Withlacoochee/Hernando County

Transect 5, Pedon 4, Wabasso fine sand.

Sandy, siliceous, hyperthermic Alfic Haplaquods

01- 1.5 to 0.5 inches; loose leaf litter.

02- 0.5 to 0 inches; leaf/root mat.

A1- 0 to 4 inches; black (10YR 2/1) fine sand; 40% of soil particles are covered or coated with organic matter; moderate medium granular structure; friable; common fine and medium roots; clear wavy boundary.

E1- 4 to 7 inches; dark gray (10YR 4/1) fine sand; few fine faint very dark gray (10YR 3/1) mottles; weak fine granular structure; friable; few fine and medium roots; clear smooth boundary.

E2- 7 to 18 inches; gray/light gray (10YR 6/1) fine sand; single grained; loose; common fine, medium and coarse roots; gradual wavy boundary.

E3- 18 to 21 inches; gray/light gray (10YR 6/1) fine sand; common medium faint grayish brown (10YR 5/2) mottles in a splotchy pattern; single grained; loose; common fine, medium and coarse roots; gradual wavy boundary.

Bh1- 21 to 23 inches; dark brown (7.5YR 3/2) fine sand; massive; friable; few fine roots; few medium ironstone concretions; sand grains thinly coated with organic matter; clear wavy boundary.

Bh2- 23 to 26 inches; dark reddish brown (5YR 3/3) fine sand; massive; friable; few medium roots; sand grains well coated with organic matter; clear wavy boundary.

BE- 26 to 28 inches; yellowish brown (10YR 5/4) loamy fine sand; few fine faint yellowish brown (10YR 5/8) and common fine faint dark brown (10YR 3/3) mottles along root channels; weak medium subangular blocky structure; friable; few medium roots; clear wavy boundary.

Btg1- 28 to 36 inches; light brownish gray (10YR 6/2) fine sandy loam; common medium distinct strong brown (7.5YR 5/8) mottles; moderate medium subangular blocky structure; friable; few fine and common medium roots; sand grains bridged and coated with clay; clear wavy boundary.

Btg2- 36 to 42 inches; gray (10YR 5/1) sandy clay; common medium prominent strong brown (7.5YR 5/8) and red (2.5YR 4/8) mottles; moderate medium subangular blocky structure; firm; few fine and medium roots; sand grains bridged and coated with clay; gradual wavy boundary.

Btg3- 42 to 60 inches; gray (10YR 5/1) sandy clay; common medium prominent strong brown (7.5YR 5/8) and few fine prominent red (2.5YR 4/8) mottles; weak, very coarse subangular blocky structure; firm; few fine and medium roots; sand grains bridged and coated with clay.

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Several alternative lists of hydric soil indicators have been proposed for use in delineating jurisdictional wetlands in the sandy landscapes of the southeast coastal plain. Because the issue is so recent, very little quantitative research has been conducted to test the validity of these alternative lists.

Presence of various hydric soil indicators from four different hydric soil lists was compared with 3 to 5 years of shallow water well data along 14 wetland transects in peninsular Florida. Lists of indicators recently proposed by the USDA Soil Conservation Service were an improvement to the list of hydric soil indicators currently mandated in the Corps of Engineers 1987 and 1989 Wetlands Delineation Manuals.

Wetland hydrology and morphological indicators of sandy hydric soils were compared at 58 sites along 14 transects in Florida. The best correspondence between hydrology and soil morphology was found for accumulation of muck on the soil surface and sulfur smell. Poorest correspondence was found for subsoil mineral horizon features such as organic accretions, thick dark A horizon, wet spodosol, and vertical streaking.

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